OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

(OTTAWA, CEDAR POINT NWR'S, DARBY, NAVARRE DIVISION'S)

OAK HARBOR, OHIO

1989 ANNUAL WATER MANAGEMENT PROGRAM

NATIONAL WILDLIFE REFUGE SYSTEM
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

ANNUAL WATER MANAGEMENT PROGRAM

REVIEW AND APPROVAL

_____	_____
Prepared by	Date
_____	_____
Wetland Associate Manager, Div. 2	Date

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1989 WATER MANAGEMENT PLAN

This annual water management program provides guidelines for water levels during a year of major dike renovation and continued drought.

It is important to note that most of Ottawa's management capabilities revolve around gravity drainage. In the mid to late 1970's, energy conservation was a factor in the design of water control structures. Dual flap gates on screw gates that faced in opposite directions were installed. Gravity was all the energy needed and the system worked well during those years. The key was to have a water source that periodically fluctuated and wind tides on Lake Erie cooperated with each blow from the southwest and northeast.

With record high water levels set in 1985, 1986 and early 1987, gravity control structures were no longer adequate. High water levels in pools could not be relieved without a major cost in money and human effort to pump it out with portable Crisafulli pumps.

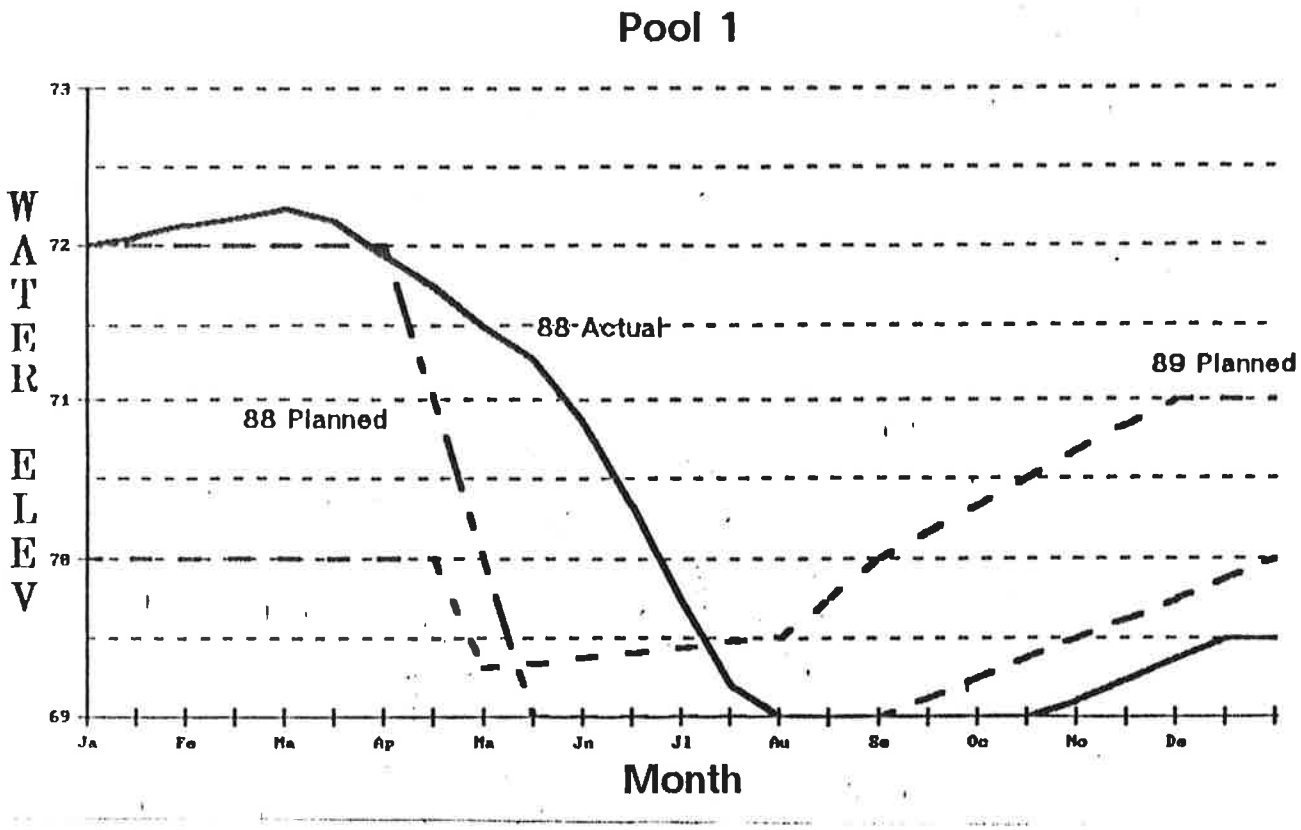
Severe erosion took place on all unprotected dikes. Defects in dikes caused ground hog and muskrat became evident. Carp find these dike leaks and can wallow out several feet of dike. Faulty water control structures became more serious as the pressure from high water tested their utility. Hundreds of acres of emergent vegetation drowned due to the inability to gravity drain in the high water years. Decreased water levels in mid 1987 permitted adequate drainage to relieve pressure on the dikes.

In 1988, many areas were drawndown to revegetate and facilitate renovation of damaged dikes, water control structures (WCS) and pump stations. Unfortunately, the drought early this year completely dried areas that were to remain partially flooded. There were no spring or summer rains to replenish the soil moisture and low lake levels prevented gravity filling most units. The low lake levels prevailed until late November, making it impossible to reflood many units without costly pumping. One positive aspect of the drought was the dieoff of thousands of carp in refuge pools. Water quality and submerged aquatics growth should improve next year.

The renovation of facilities is funded with the 5.2 million dollars appropriated by Congress for flood damage. This year's water management program will revolve around construction in the following pools:

Ottawa; Pools 1 & 3, Show and Entrance Pools, MSU 3, 4, 5, 7 A&B, A8 and the Mini-Marsh
Cedar Point; Pool 1, Pheasant Farm
Darby; Pools 2, 3 & 4

1. Unit Pool 1
2. Acres 275
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed - _____



7. Vegetation: As of August 29

Species	%1986	%1987	%1988
Open Water	65	60	5
Cattail	15	15	15
Aquatic Smartweed	10	10	5
Smartweed/Nutsedge	5	5	65
Other	5	10	10

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	30,000	50,000	93,700
Geese	4,200	10,000	44,000
GBH	2,000	2,500	3,300

9. Purple Loosestrife: Slight to moderate infestation of plants scattered throughout unit. They were sprayed with the backpack sprayers.

Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were as planned until April when the decision was made to delay drawdown until spring migration was over. Water was drained slowly from May to July by gravity drainage, and pumping through the adjacent ODNR pump, and finishing with the Crisafulli. The drought completely dried up residual water in the bays by late July. Levels remained low for the rest of the year as construction proceeded.

Results:

Mudflats and dying carp attracted great number of shorebirds, herons and egrets. Staff and volunteers regularly checked the are for signs of a botulism outbreak with negative results. Excellent stands of nutsedge in the low areas and millet/smartweeds in the higher elevations resulted from the drawdown. There was no germination of purple loosestrife, but several new clumps of mature plants were sprayed after the area was surveyed with the ATV. The 6-8 inches of water in bay areas attracted large numbers of migrating waterfowl in the fall. Peak populations in the unit reached 5,000 birds.

Facilities:

The construction contract was awarded to the George Gradel Co. in March to reconstruct the north and south dikes and replace the silted water control structure (WCS) on the southeast corner. Work began in August and by the end of the year, earthwork was completed on the north dike. The rest of the contract will be completed in 1989.

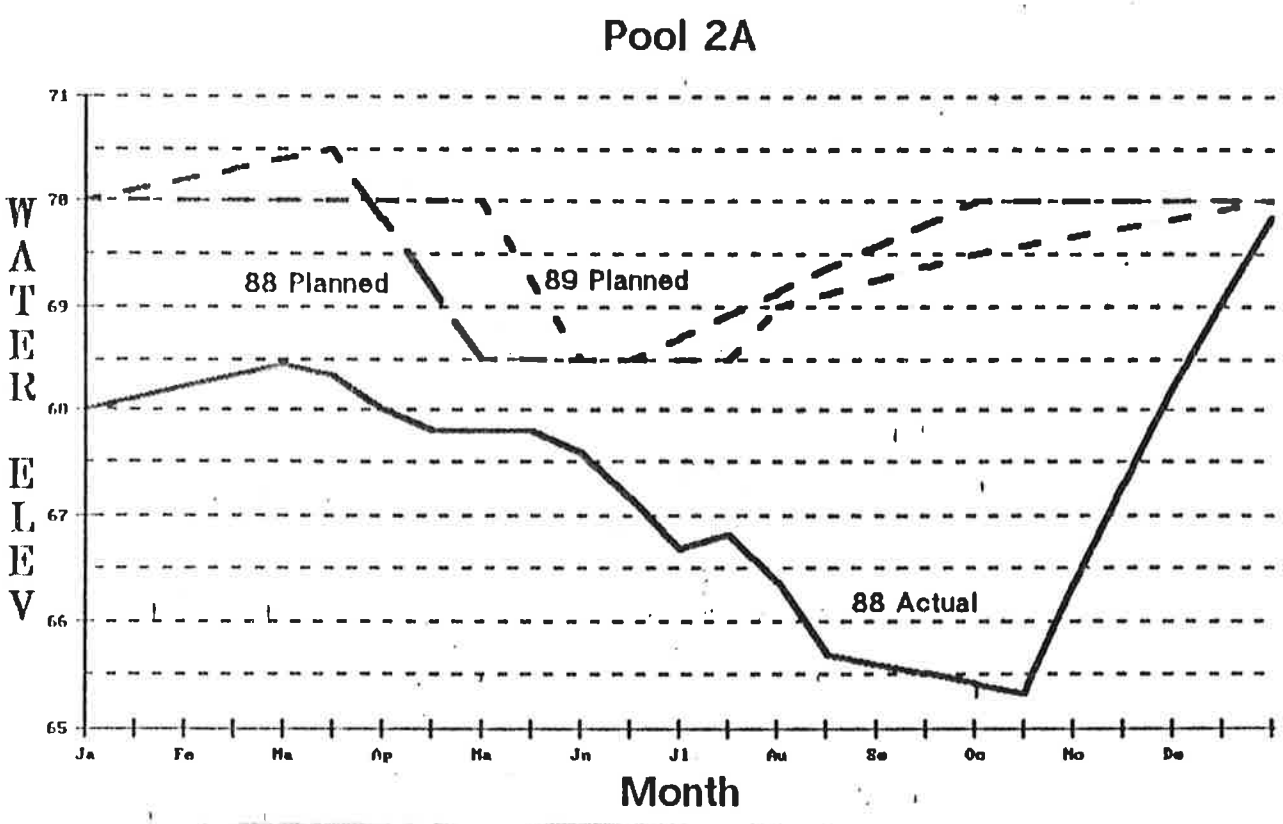
Costs:

Approximately $500,000 was paid to the contractors by year's end. Water that was not gravity drained was pumped by the Ohio Department of Natural Resources (ODNR).

B.2 Objectives of the 1989 Proposed Water Levels

Continued drawdown coordinated with construction to complete scheduled dike renovation and water control structure replacement. Reflood slowly after completion of the work.

1. Unit Pool 2A
2. Acres 70
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 568
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	50	20	10
Water	5	5	0
Mixed Forbes/Other	25	40	35
Smartweed/Velvet Leaf	20	10	45
Aquatic Smartweed	1	0	0
Mudflats/Bidens	0	25	10

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	25,000	40,000	51,300
Geese	15,000	20,000	39,800
GBH	1,000	1,000	1,000

9. Purple Loosestrife: Two plants found and sprayed in 1987, none found in 1988.

Pool 2A

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were well below the plan due to our ability to add water without costly pumping. The drought slowly evaporated water in the pool until the ditch was almost dry (approximately 3 feet below pool bottom). Water was eventually added by gravity filling until it was high enough to flush the sand out of the 2A/2B water control structure.

Results:

Last year's objective of encouraging emergents was not realized because of the low levels. However, excellent stands of moist soil annual did develop in the mudflats to provide food for migrating waterfowl. Cootonwood, willow and sweet clover dominate the higher elevations. The area was heavily used by waterfowl late in the year.

Facilities:

The north, south and west dikes are in excellent condition. The east dike has some erosion ploblems at the toe. The clogged water control structure has been flushed. A water level gauge has been installed.

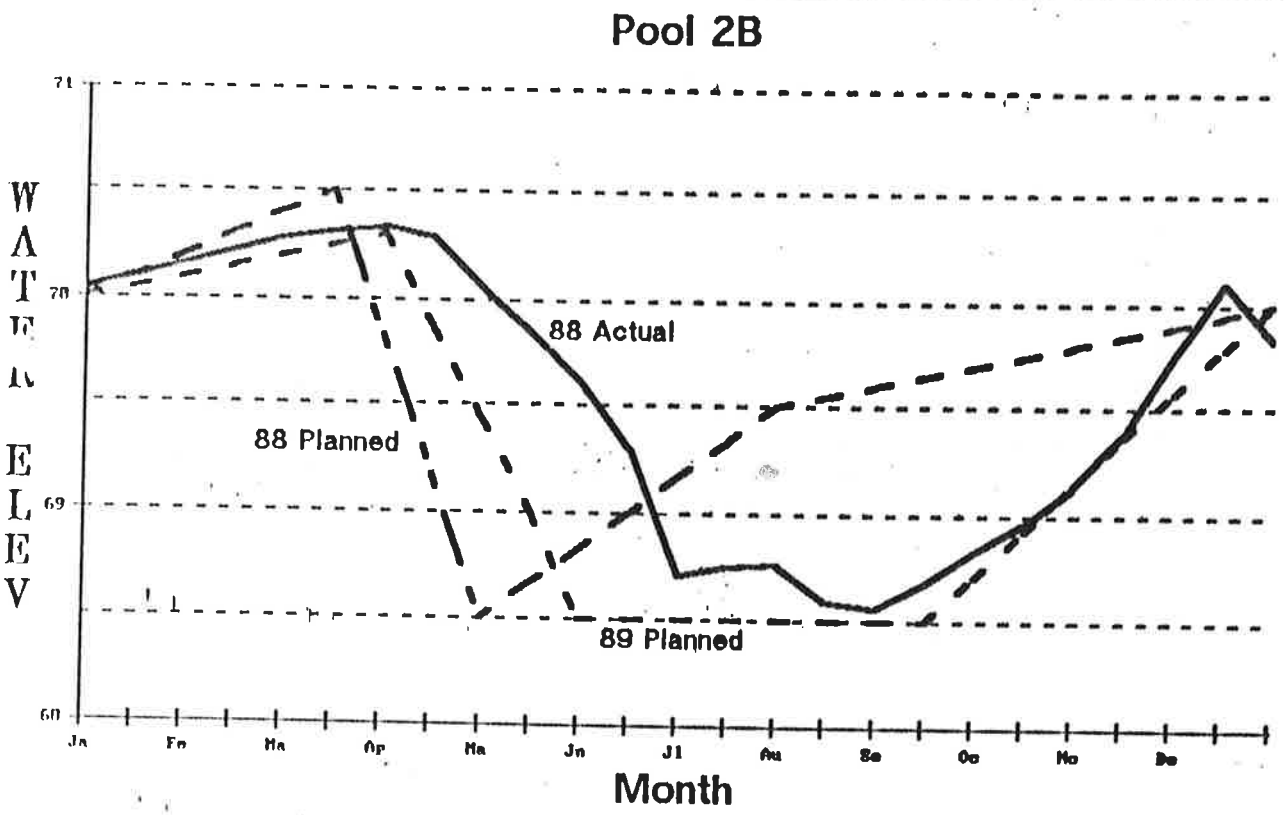
Costs:

Water level gauge materials totalled $800. The dikes were mowed once.

B.2 Objectives of the 1989 Proposed Water Levels

Drawdown enough to keep the area wet to encourage emergent vegetation. Evaluate the area in early summer to determine is purple loosestrife has spread.

1. Unit Pool 2B
2. Acres 95
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 568
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Cattail	2	3	3
Willow	8	8	10
Smartweed/Millet	40	25	30
Open Water/Cottonwood Seed	40	45	47
Smartweed/Cottonwood Seed	10	21	5
Bidens/Milkweed/Other	0	12	10

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	20,000	41,000	47,100
Geese	20,000	12,000	22,300
GBH	3,000	1,500	1,600

9. Purple Loosestrife: Several first year plants were found and sprayed.

Pool 2B

A.2 Effects of Past Year's Water Levels

Levels:

The scheduled spring drawdown was delayed due to wetland restoration activities. The area cannot be gravity drained unless the adjoining units are completely dry, so the Crisafulli was used to pull the pool down. After vegetation responded, water was added slowly from 2C until the planned level was reached in the fall.

Results:

Excellent submerged aquatics developed in the bay and were heavily used by wood ducks until late summer. The cottonwood seedlings in the bay are dead, but more seedlings cover the higher elevations on the east side. Good stands of millet and smartweeds grew along the pool edges.

Facilities:

The toe of the north and west dikes are eroded from past high water levels. The east, north and south (only east side of south dike) dikes were sloped, and filter fabric and rock placed in the spring. The silt and sand that clogged the water control structure between Pools 2A and 2B was flushed out by the high water levels in the fall. A water level gauge was placed in the NW barrow pit. It covers the lower elevations not covered by the gauge on the Pool 2B/C WCS.

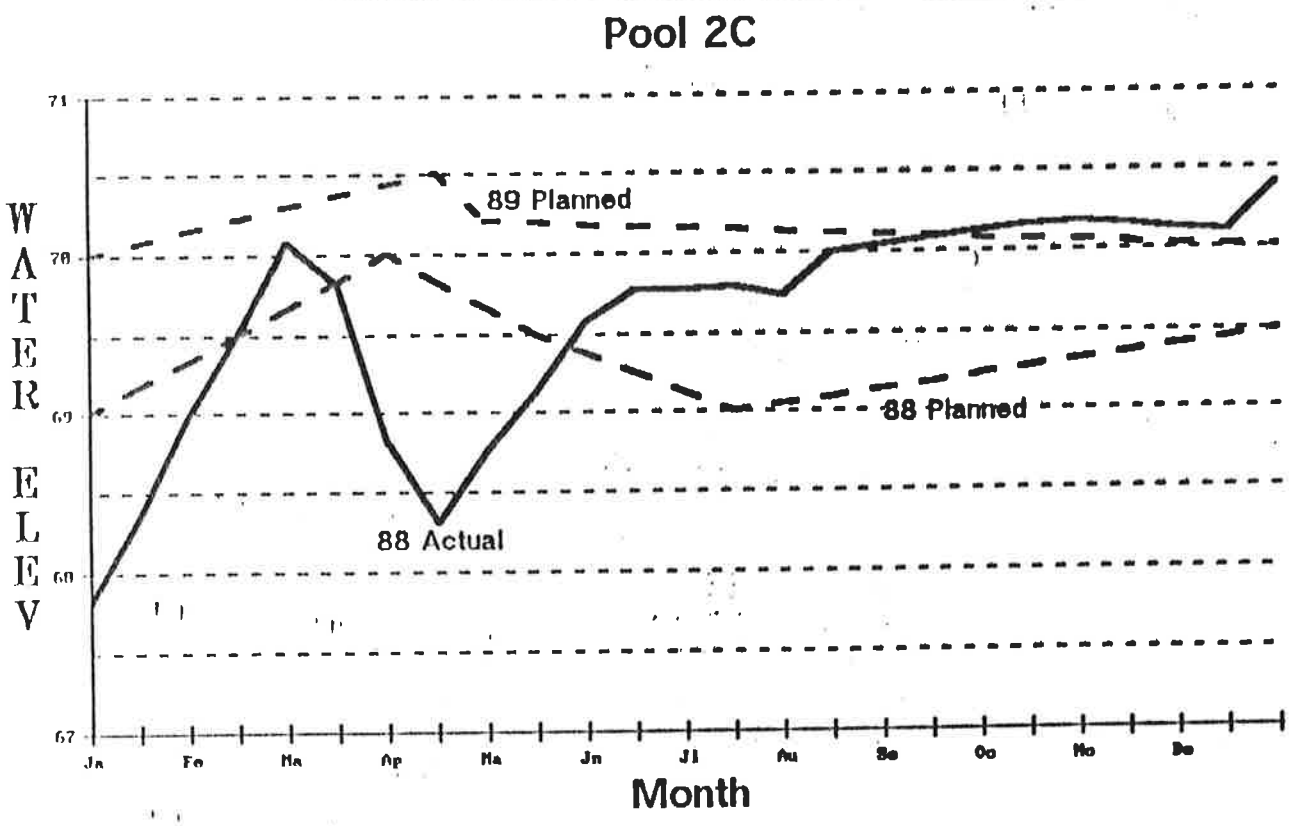
Costs:

Pumping the unit down with the Crisafulli cost $525. Filter fabric and rock were placed on the east and south dikes. Piles of rock were dumped on the west dike, but not graded out. Installation of the water level gauge was $800 for materials. All dikes were mowed once.

B.2 Objectives of the 1989 Proposed Water Levels

Water levels will be kept muddy to wet in the lower elevations to encourage emergent vegetation. The higher elevations on the east end will be dry enough to mow the cottonwood seedlings. Shallow flood during the summer if precipitation does not keep the area moist.

1. Unit Pool 2C
2. Acres 80
3. Maximum elevation permissible 571
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Aquatic Smartweed	0	1	1
Smartweed	20	10	15
Millet/Other	50	50	34
Open Water/Submergents	30	40	45
Cattail	____	____	5
_____	____	____	____

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	10,000	42,000	55,000
Geese	20,000	25,000	24,400
GBH	3,000	2,500	1,900

9. Purple Loosestrife: Several first year plants were found and sprayed.

Pool 2C

A.2 Effects of Past Year's Water Levels

Levels:

A water level gauge was installed in May. The difference in the gauge reading and the old method of determining water levels is approximately 1 1/2 feet. The discrepancy between the two accounts for the large difference between the actual and planned levels on the graph. The lack of an accurate gauge made planning the water levels for the year difficult. However, once the gauge was installed and appropriate levels could be estimated, the plan changed accordingly. The revised planned water level was allowed to fluctuate between 69.8 and 70.1. Contractors pumped into 2C to dewater Radar ditch in November when 8B was full.

Results:

Last year's objectives of flooding the unit to drown cottonwood seedlings in the bays and encourage emergents in the shallower areas was accomplished. The cottonwood seedlings have been set back, and narrowleaf cattail is spreading throughout the unit. Smartweeds and millets covered half of the pool.

Facilities:

The section of the south dike that required rip rap was finished. The west dike was sloped, graded and filter fabric and rip rap placed. A new water level gauge was installed. The ground immediately around the Pool 2B/C WCS is eroding. A muskrat hole follows the culvert through the dike.

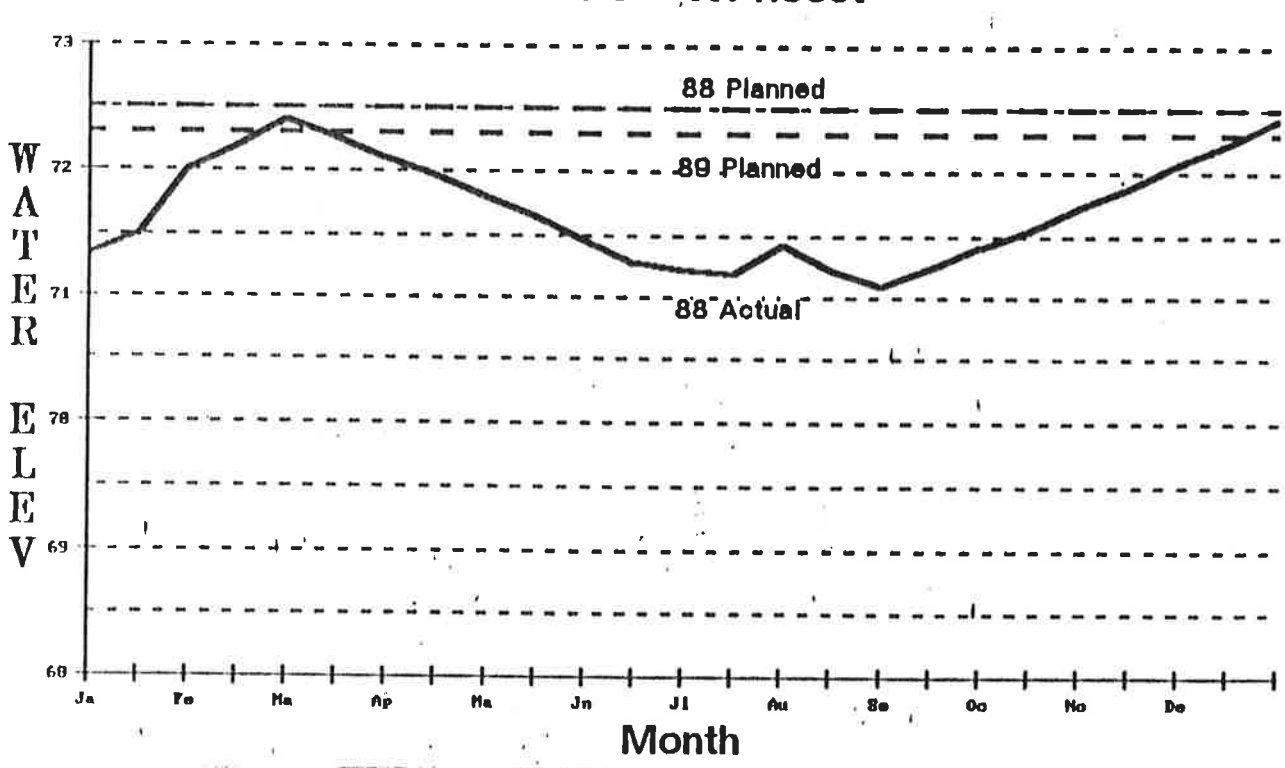
Costs:

Installation of the water level gauge - $ 800 for materials. All dikes were mowed once.

B.2 Objectives of the 1989 Proposed Water Levels

Keep water levels relatively stable throughout the year to encourage further growth of emergents and allow for submergent plant growth.

1. Unit Pool 6 (Woodies Roost)
2. Acres 160
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	50	50	35
Wooded	10	10	10
Cattail	40	40	39
Smartweed/Millet	____	____	15
Aquatic Smartweed	____	____	1
_____	____	____	____

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	unknown	10,000	6,000
Geese	" "	20,000	9,200
GBH	" "	2,500	1,800

9. Purple Loosestrife: Area surveyed - No loosestrife found this year.

Pool 6 (Woodies Roost)

A.2 Effects of Past Year's Water Levels

Levels:

The pool's eroding dikes are incapable of retaining the high water levels planned for the year. The water level dropped with lake levels and adjacent ODNR areas in the spring. Efforts to let water in through the ODNR canal failed when the water leaked out/evaporated. Water levels rose in the fall when lake levels rose, the adjoining marsh was reflooded and precipitation fell.

Results:

Last year's objective to open the dense cattail with high water was not met. However, vegetation response to the unexpected drawdown was excellent. Dense smartweed grew along the waters edge and in muskrat eatouts.

Facilities:

East and south dikes are no longer capable of retaining water. Both dikes are severely eroded in areas and are riddled with muskrat/woodchuck holes. The north half of the east dike is overgrown with sumac and dogwood and is barely wide enough to ride an ATV on. The north dike also has some erosion and muskrat hole problems.

Costs:

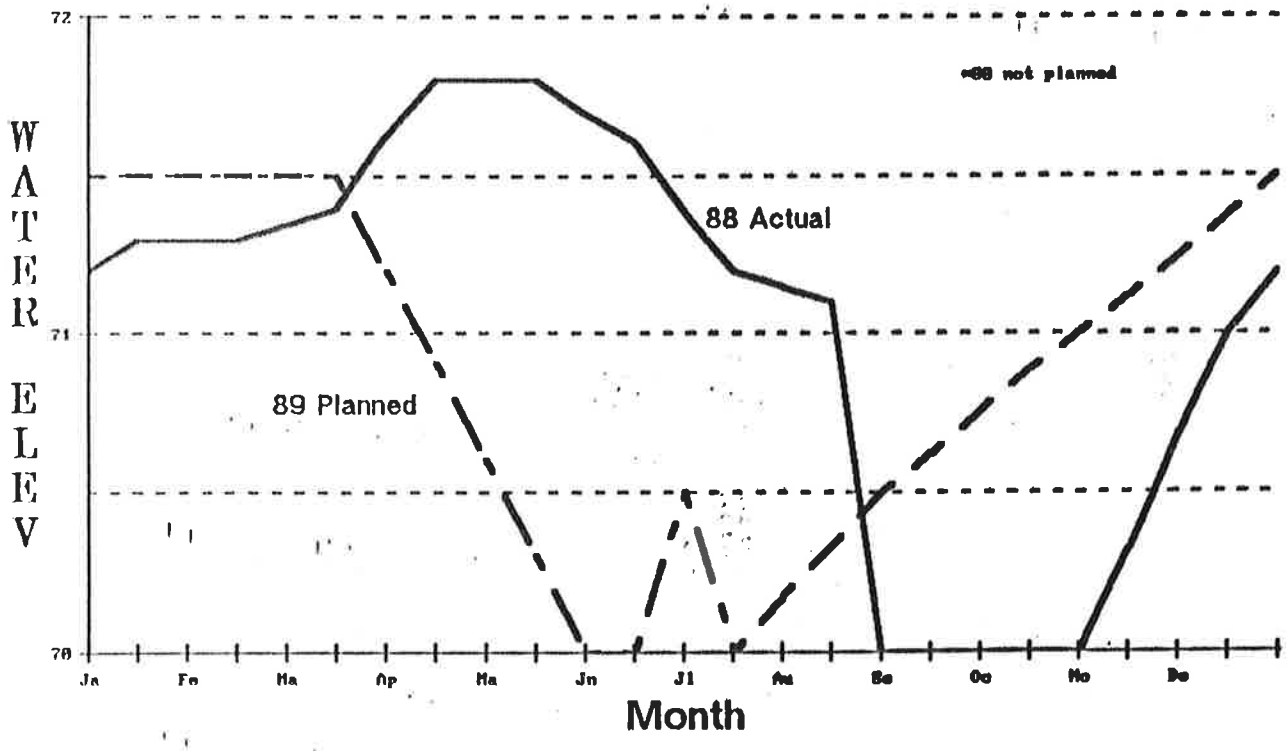
Brush along the south and north dikes was mowed once.

B.2 Objectives of the 1989 Proposed Water Levels

Attempt to hold water high this year to allow the muskrat population to build and open the dense cattail stands along the pool's edge. The pool should hold water if the ODNR does not lower their adjacent unit.

1. Unit Pool 3
2. Acres 260
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - 570.5

Pool 3



7. Vegetation:

Species	%1986	%1987	%1988
Open Water/Mud Flats			50
Wooded			12
Cattail			12
Smartweed/Millet			25
Annual Smartweed			1

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks			94,800
Geese			49,600
GBH			3,300

9. Purple Loosestrife: Slight to moderate infestation on the north side. Area sprayed with the truck and backpack sprayers.

Pool 3

A.2 Effects of Past Year's Water Levels

Levels:

Water levels fluctuated with Lake Erie until the dike was plugged and the pool dewatered in August. Precipitation filled the pool after earthwork was completed in November.

Results:

Although water levels were not controlled, lake levels came down enough to allow excellent stands of smartweed and walter's millet to grow in all sections but the main bay.

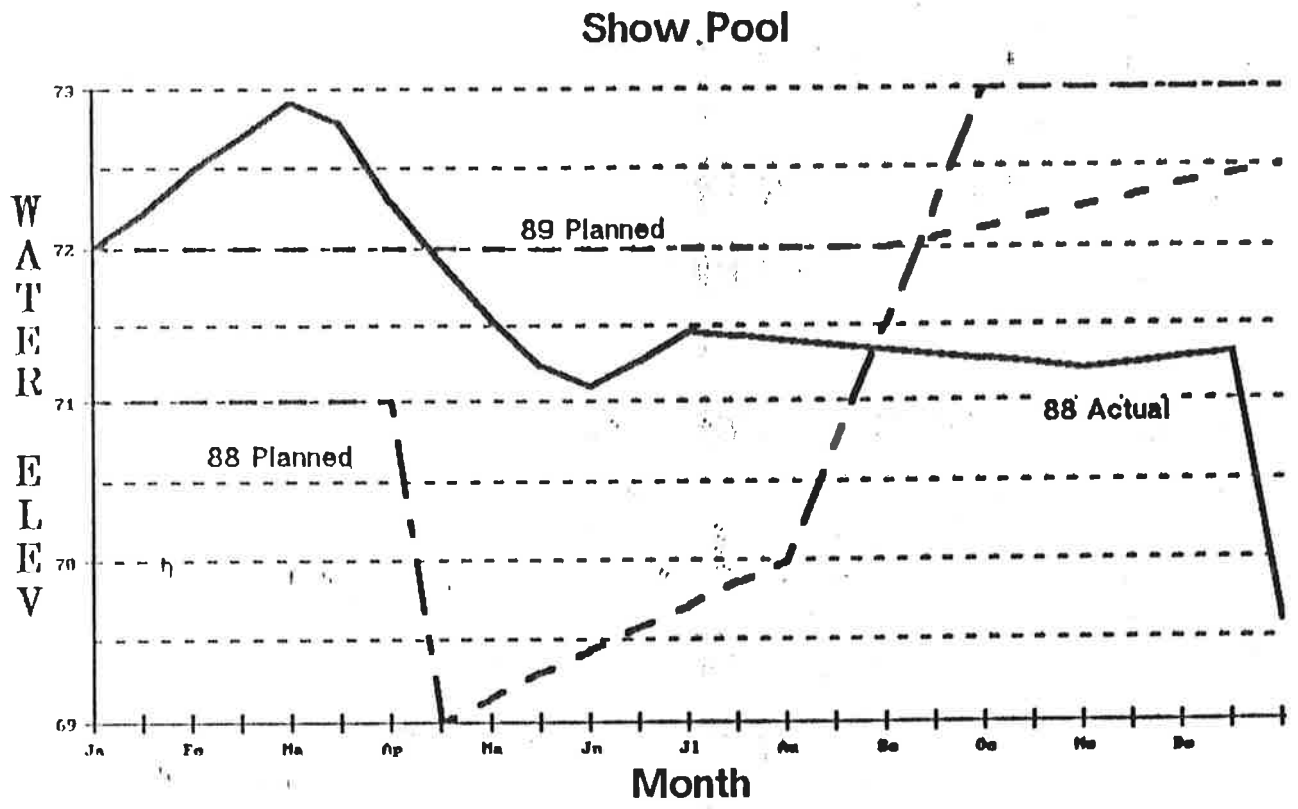
Facilities:

Construction began in August to repair the breached south dike. By year's end, all earthwork was finished. Filter fabric, rip rap, and the water control structure will be placed in 1989. There is minor erosion at the toe of the north dike.

B.2 Objectives of the 1988 Proposed Water Levels

Drawdown by early June to facilitate construction of the water control structure and allow the bay to revegetate. When the pool is flooded, the vegetation will help stabilize the bottom substrate and decrease wind and wave action. Water quality will improve for submerged aquatic plant development.

1. Unit Show Pool
2. Acres 30
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 572
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	20	35	35
Cattail/Bulrush	20	5	10
Wet Meadow/Smartweed	30	10	30
Cottonwood	10	15	10
Submergents	20	25	0
Phragmites	0	15	15

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	5,000	8,000	1,900
Geese	3,000	7,000	10,200
GBH	1,500	1,000	1,700

9. Purple Loosestrife: Scattered plants and clumps sprayed along dikes and canal.

Show Pool

A.2 Effects of Past Year's Water Levels

Levels:

A faulty water control structure allowed the pool to fluctuate with Lake Erie until July. At that time, a coffer dam was installed. The dam and the pipe plug remained in place until the end of the year. Water levels were fairly stable July - December, approximately 6-8" below the general pool bottom.

Results:

Objective of drawdown to repair WCS accomplished. Smartweed covered areas that were previously open water. Phragmites patch is expanding and should be controlled. Cottonwoods have either died or been set back.

Facilities:

The north and east dikes are eroded to 90 degree banks. However, both dikes are part of the construction haul road out to pool 1 and have been cleared and graded. They are scheduled for reconstruction in 1989. The south dike leaks into the wooded area around the shop and office. There are currently no plans for repair. The faulty water control structure was fixed in November.

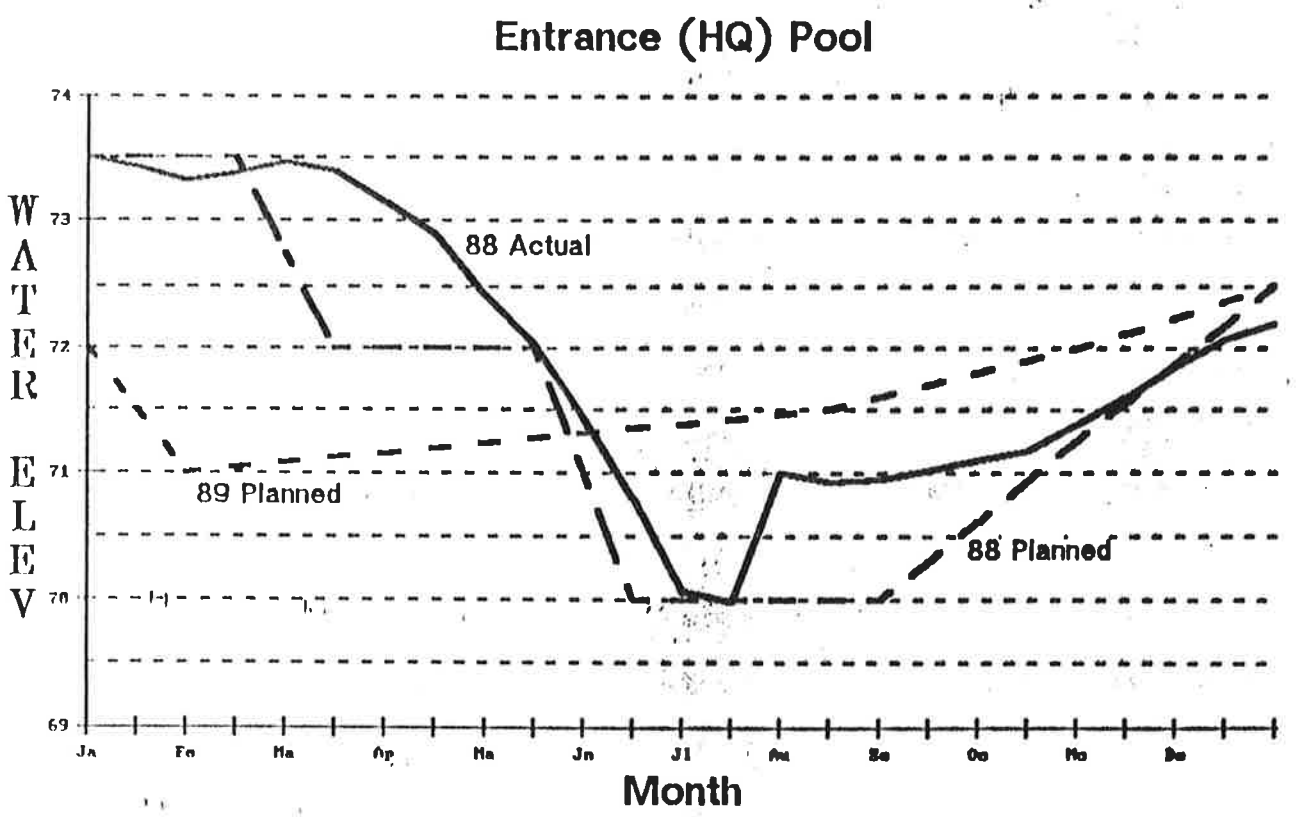
Costs:

All clearing, grubbing and grading of the dikes is covered by the Pool 1 contract. The east dike was mowed twice and purple loosestrife sprayed along the edges of the pool. Water level gauge installed with steel pipe cost $ 800 for materials.

B.2 Objectives of the 1989 Proposed Water Levels

Keep the canal water level at general pool bottom levels to facilitate construction. Water will be pumped from Pool 1 through the pool and drained into Radar ditch. Phragmites should be sprayed in the fall with the herbicide "Rodeo".

1. Unit Entrance (HQ) Pool
2. Acres 30
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	10	20	10
Cattail	35	50	7
Wet Meadow	35	20	20
Smartweed	20	0	15
Willow/Brush	0	10	10
Upland			38

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	15,000	10,000	2,200
Geese	20,000	8,000	5,800
GBH	3,500	1,000	600

9. Purple Loosestrife: Infestation upgraded from slight to moderate. Three patches of first year plants, individual plants, and mature clumps were sprayed.

Entrance Pool

A.2 Effects of Past Year's Water Levels

Levels:

Actual water levels were per plan for the year. Area was gravity drained from March to June. A foot of water was added in July and again in August to reduce the botulism potential around the water control structure and to wet the pool. Precipitation filled the pool in the fall.

Results:

Excellent vegetation response with smartweed and millets developing in lower areas. Unfortunately, purple loosestrife and invading hardwoods also developed.

Facilities:

The north dike is badly eroded and was scheduled for resloping and rip rapping in 1988. Contractors rescheduled the work for 1989 after Pool 1 is almost finished.

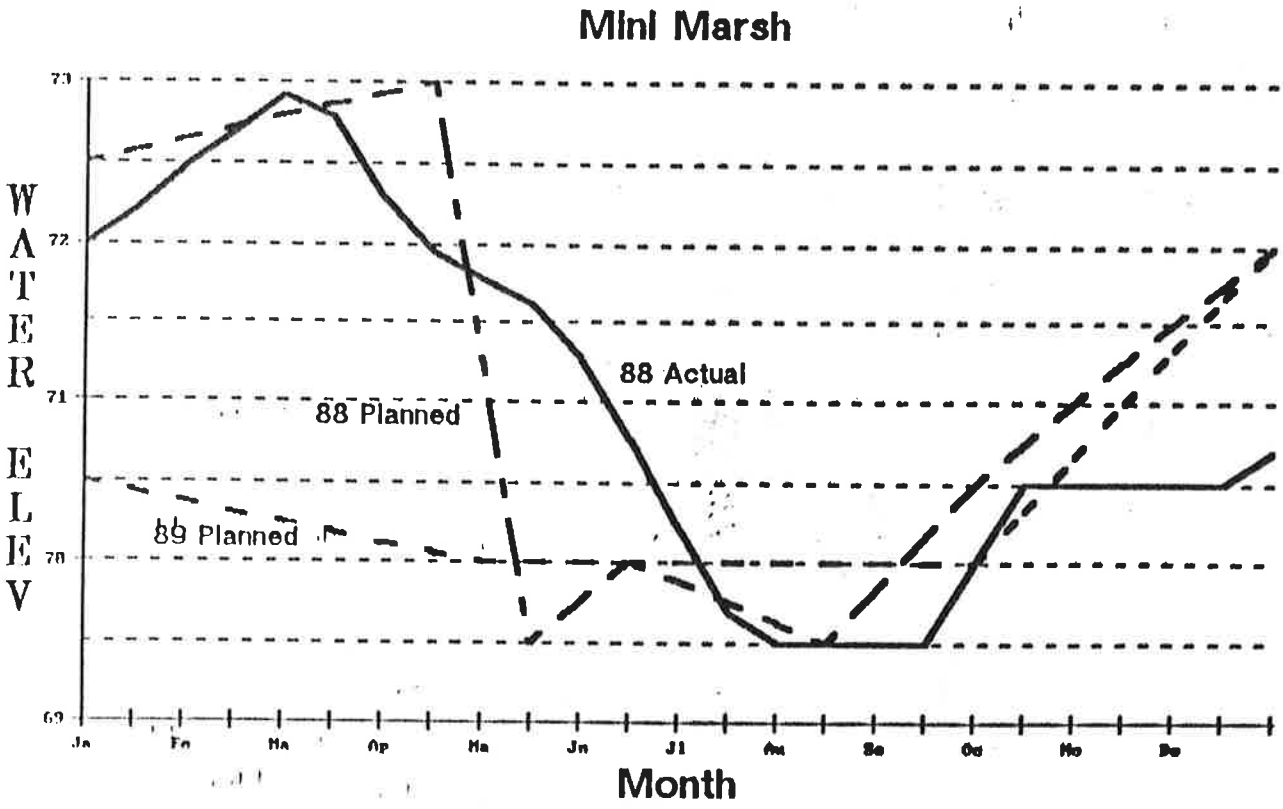
Costs:

The west dike was mowed twice and a new water level gauge installed.

B.2 Objectives of the 1989 Proposed Water Levels

Drawdown to complete dike repairs and rip rap the north dike. Once repairs are complete, permit precipitation to slowly increase levels until fall. Add water at that time if necessary.

1. Unit Mini Marsh
2. Acres 16
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 571
5. Water Elev. with 50% bottom exposed - 570.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	10	10	0
Cattail	40	40	30
Other	10	10	15
Dead Cattail (Submergents)	40	0	0
Smartweed/Millet			55

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	8,000	10,000	1,000
Geese	2,000	750	1,500
GBH	200	1,000	600

9. Purple Loosestrife: None Noted.

Mini Marsh

A.2 Effects of Past Year's Water Levels

Levels:

Precipitation was allowed to fill the pool until mid March. After the stoplogs were pulled, the area drained as lake levels declined. It remained dry until September when lake levels rose. One board was replaced and precipitation partially filled the pool. Lake levels did not rise enough to bring pool levels up to plan.

Results:

Nutsedge and smartweeds covered the east end of the marsh and muskrat eat outs. All carp died when the pool dried up.

Facilities:

The north and east dikes are severely eroded and not safe for vehicle travel. All dikes are riddled with woodchuck and muskrat holes and are unsafe for walking. The pump station is nonfunctional, but scheduled for replacement in 1989. A trench will be dug from the water control structure in the northeast corner to the new pump. The water control structure is the stoplog type and placed too high to be effective unless the lake is very cooperative. There is severe erosion around the WCS. A water level gauge is needed in this pool.

This area is scheduled for construction funding within the Pool 7 Project. Hopefully, repairs will begin in 1989.

Costs:

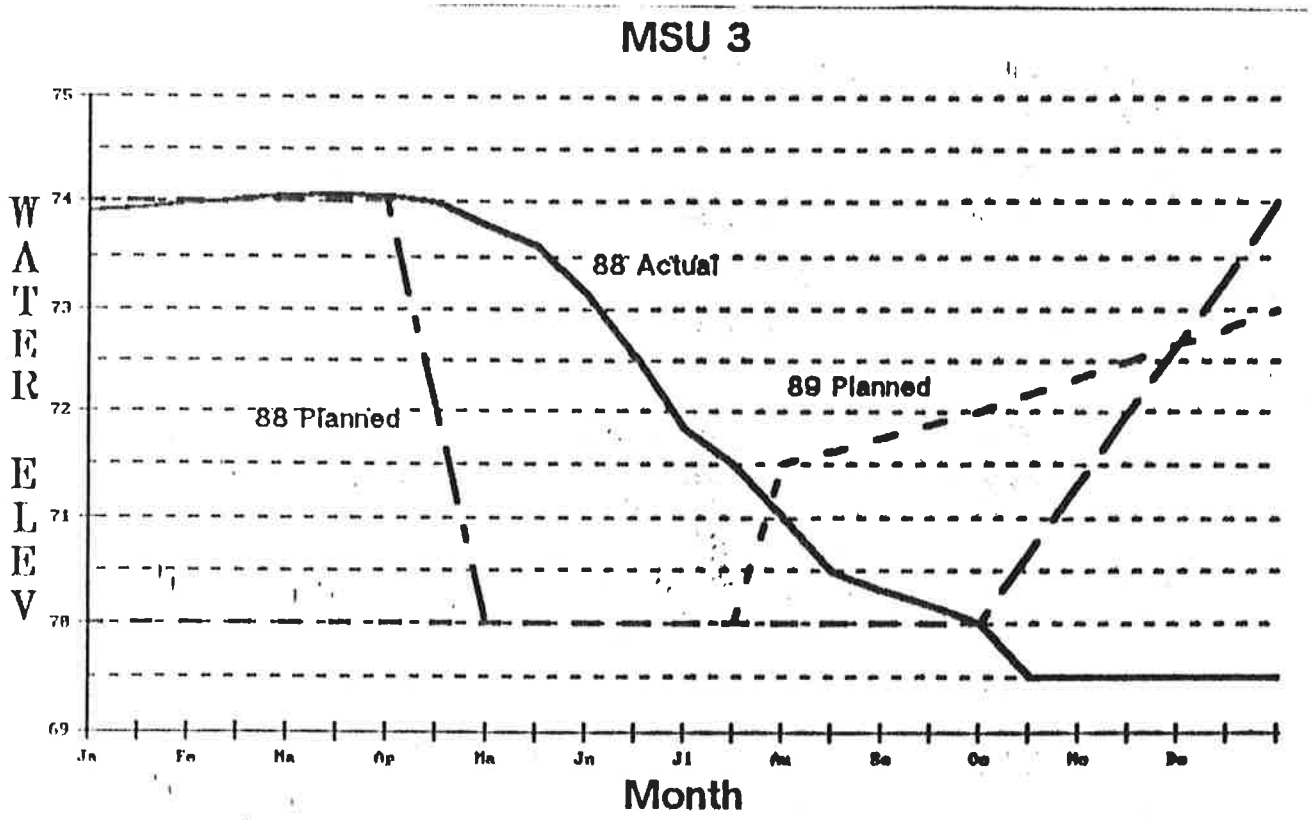
None.

B.2 Objectives of 1989 Proposed Water Levels

Drawdown by early May to facilitate trenching. Fill in late summer/early fall after the trench is dug and pump is working.

The 1989 plans may change because of the pending construction project.

1. Unit MSU 3
2. Acres 213
3. Maximum elevation permissible 574.5
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Emergents	70	75	50
Open Water	10	0	10
Smartweed/Millet	5	20	20
Bidens/Cottonwood	15	5	5
Wet Meadow			15

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	500,000	400,000	97,300
Geese	100,000	275,000	79,000
GBH	5,000	1,500	2,300

9. Purple Loosestrife: Area surveyed with ATV - no loosestrife found.

MSU 3

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were per plan until April. Levels were allowed to remain high to provide much needed brood habitat until construction required that it be completely dry. The unit drained slowly through 1 or 2 unbroken tile that are functional when the ditch is low. Levels were kept below the general pool bottom August to December for construction.

Results:

There was an excellent response to the late drawdown with a good interspersion of cattail, smartweed, millet, bulrush and burreed. Unit was well-used by waterfowl in the spring, but lack of water in the fall reduced duck use.

Facilities:

All earthwork on the MSU 3/4 crossdike and MSU 3 north dike was completed by the end of the year. The rest of the work (placement of WCS, filter fabric, rip rap and topsoil) will be finished in 1989. Refuge staff continued to work on the west dike. The north portion of the dike was bulldozed to strengthen it, but more fill must be placed and sloping and rip rap done to finish it. The south dike is eroded at the toe, but is not scheduled for work in the near future.

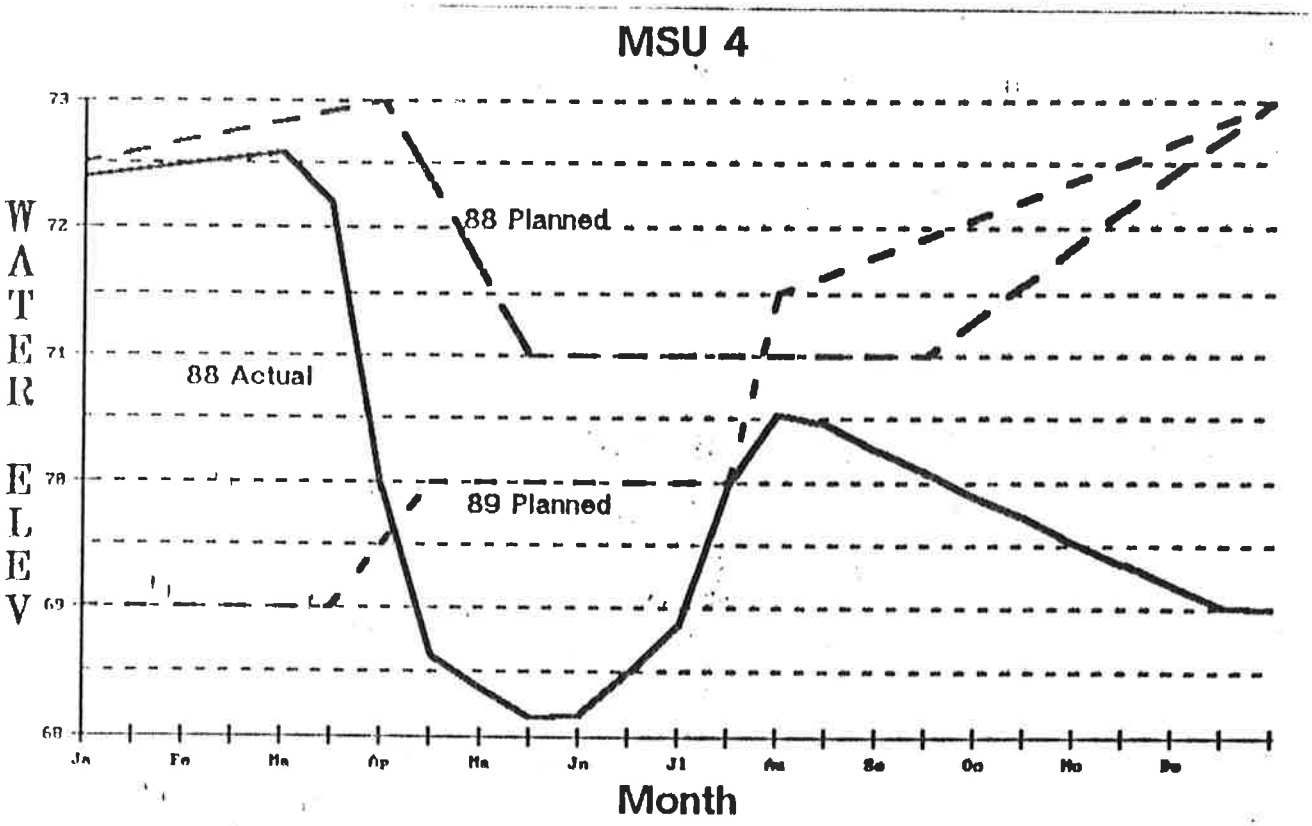
Costs:

Construction costs are covered under the Radar Ditch Project. Several acres of cottonwood saplings were mowed in September. Pumping costs totalled $ 715 for the year.

B.2 Objectives of the 1989 Proposed Water Levels

Keep the unit dry until construction is completed, then slowly reflood in late summer/early fall.

1. Unit MSU 4
2. Acres 106
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Reed Canarygrass/Willow	3	3	15
Cattail/Willow	1	0	0
Millet/Bidens/Smartweed	1	12	50
Agriculture	90	75	30
Borrow	3	5	5

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	5,000	15,000	4,400
Geese	150,000	30,000	4,700
GBH	100	250	400

9. Purple Loosestrife: None noted.

MSU 4

A.2 Effects of Past Year's Water Levels

Levels:

Water control structure gates were open in March to allow the unit to gravity drain for construction. The unit was drawn down early so preliminary work could be done on the north end before refuge equipment was reassigned to wetland restoration activities. The unit was kept dry for the rest of the year as construction proceeded. The general unit bottom is 71.5. The apparent 2 1/2' rise in water level was only in the ditch and was done to remoisten drought-dried soils.

Results:

Areas that were not planted to corn produced only a sparse covering of smartweed, reed canary grass and willow. The area was kept too dry to produce moist soil plants. The corn planted for black bird research did not develop any kernels on the cob. There was comparatively no waterfowl use this year.

Facilities:

Earthwork on the MSU 3/4 crossdike and MSU 4 north dike was completed by the end of the year. The other dikes and water control structure are in good shape. The area should be kept high after construction is finished to drown the reed canary grass and willow.

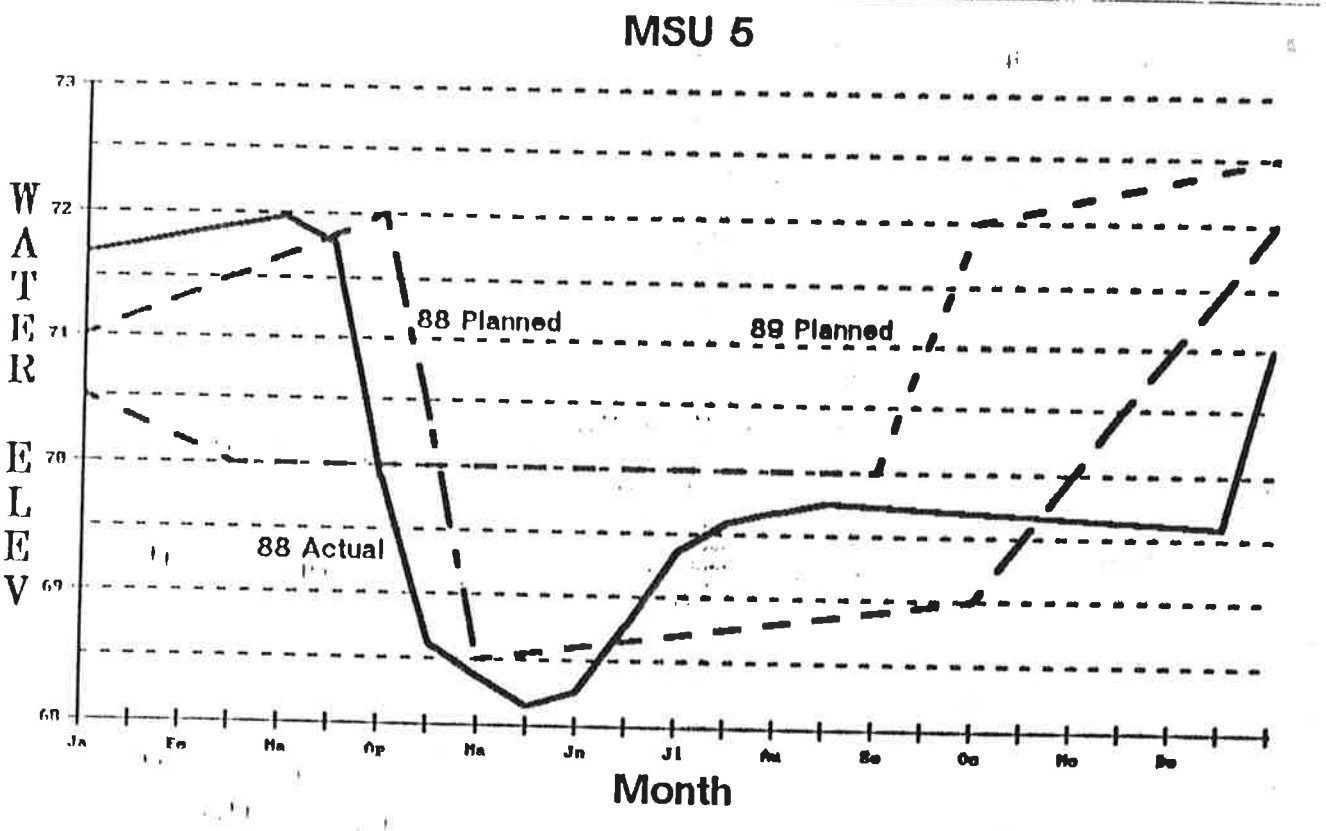
Costs:

Construction costs are covered in the Radar ditch contract. Electricity to run the moist soil pump cost approximately $ 715.

B.2 Objectives of the 1989 Proposed Water Levels

Keep the unit dry until construction is completed, then fill the ditch until the unit is wet to moist. Flood the unit in fall for the waterfowl migration.

1. Unit MSU 5
2. Acres 250
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 570.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Millet/Smartweed	30	6	55
Agriculture	30	80	0
Bidens	5	0	10
Cattail/Reed Canarygrass	5	5	10
Cottonwood/Willow	30	5	15
Velvet Leaf	0	4	10

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	100,000	350,000	4,400
Geese	300,000	290,000	5,500
GBH	1,000	500	700

9. Purple Loosestrife: One plant found and sprayed.

MSU 5

A.2 Effects of Past Year's Water Levels

Levels:

Actual levels generally followed planned levels during the year. Drawdown was two weeks earlier than planned and the unit was not reflooded in the fall. The apparent 1 1/2' increase of levels in fall was the difference between the old and new water level gauges.

Results:

Vegetation response was poor over the entire unit. The early drawdown and very dry conditions during the spring and summer encouraged more velvet leaf, cocklebur and established willow seedlings than moist soil plants. Some areas remained bare soil. A few small stands of smartweed grew in low areas or close to the ditch. Large areas of cocklebur/velvet leaf and saplings were mowed in August. The new sponge weed wick was used to apply Roundup to willow sprouts with variable results. The wick will have to be tested again next year to determine if it works adequately. A ten foot wick is not wide enough to cover large areas in short periods of time. It should be used in small localized areas only. A different method of brush control should be used in large areas.

Facilities:

Earthwork on the north dike was completed by year's end. Filter fabric, rip rap and placement of the water control structure is scheduled for 1989. The strip of willow, reed canary grass and concrete foundation on the west end was cleared when the shallow barrow pits were dug. A new water level gauge was installed.

Costs:

Construction costs are covered by the Radar ditch contract. Areas in the unit were mowed and willow seedlings weed wicked. Electricity to run the moist soil pump totalled $ 715 for the unit.

B.2 Objectives of the 1989 Proposed Water Levels

Keep the unit dry until construction is completed, then raise water levels until wet to moist. Flood in the fall for migration.

1. Unit MSU 6
2. Acres 70
3. Maximum elevation permissible varies with lake
4. Flowline elevation of lowest structure None
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____

Water level varies with lake - no chart

7. Vegetation:

Species	%1986	%1987	%1988
Cottonwood/Willow	35	40	25
Wet Meadow	10	5	5
Cattail	50	50	45
Other	5	5	5
Smartweed/Millet			20

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	5,000	3,000	3,100
Geese	1,000	1,500	2,500
GBH			1,100

9. Purple Loosestrife: None noted.

MSU 6

A.2 Effects of Past Year's Water Levels

Levels:

The unit fluctuates with the lake through breached dikes. The lake levels have dropped this year from their record levels in 1986-7, so the unit remained dry.

Results:

Excellent stands of smartweeds/millets interspersed with cattail. The cattail will be replaced if lake levels remain low. Willow, cottonwood and phragmites are expanding into the area.

Facilities:

The north and south dikes need complete rebuilding to make this a functional unit. The east and west dikes will also require major repairs. Minor extension of inlet/outlet culverts to the moist soil pump is all that's needed to provide active water level control if the dikes could hold water. There are no current plans to renovate this unit.

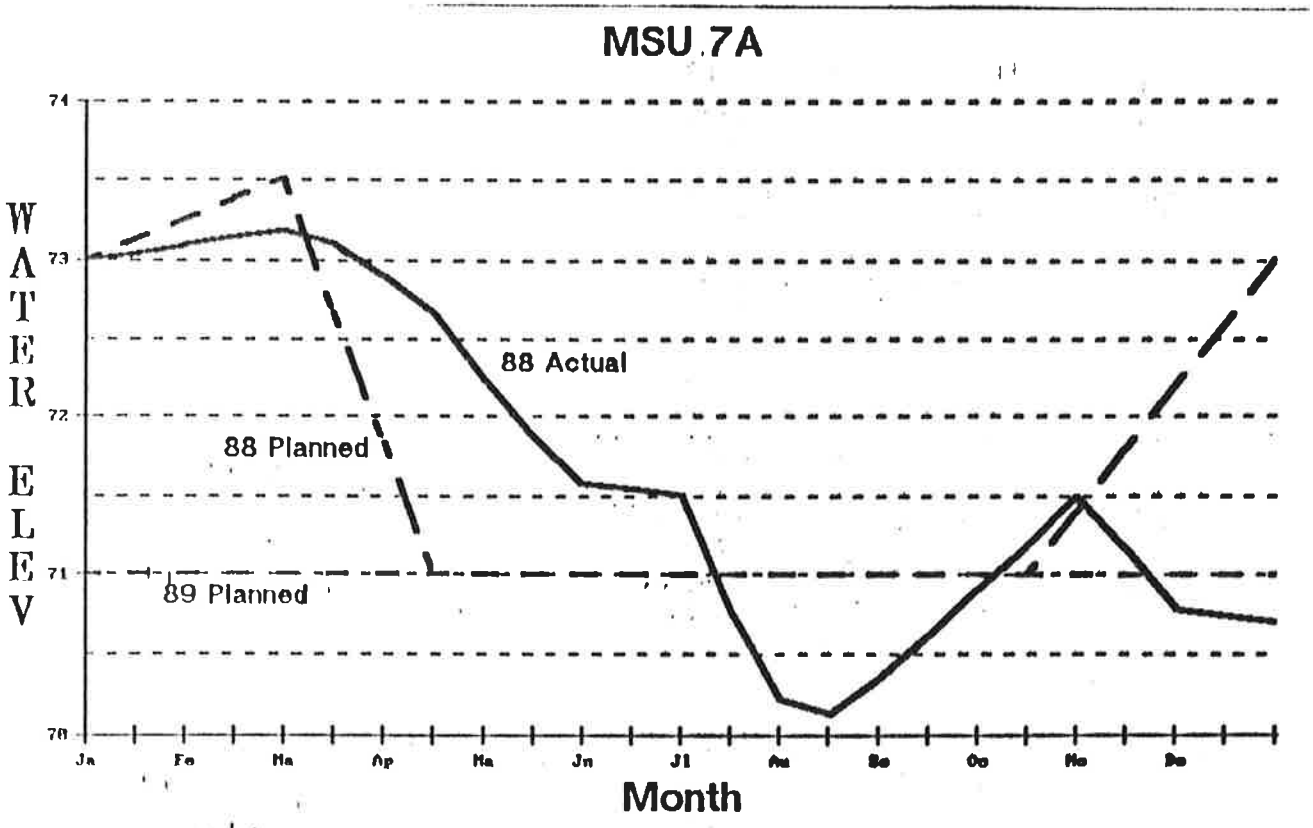
Costs:

None.

B.2 Objectives of the 1989 Proposed Water Levels

No way to control water levels in this unit. It is kept in the management regime as a reminder that it requires attention.

1. Unit MSU 7A
2. Acres 49
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 572.0
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Upland Species	20	30	30
Cattail	5	0	0
Millet	30	25	15
Bidens	40	45	30
Smartweed	5	0	25

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	20,000	22,000	19,200
Geese	30,000	45,000	19,500
GBH	1,000	600	250

9. Purple Loosestrife: Scattered plants in one centralized location. Sprayed with backpack sprayer.

MSU 7A

A.2 Effects of Past Year's Water Levels

Levels:

A faulty water control structure delayed draw down. It was pumped down with the Crisafulli pump in late March and kept down through December for construction.

Results:

Area was extremely dry all summer. Plans to farm part of the unit were dropped. Upland species such as goldenrod, cocklebur and asters covered most of the unit. Barley foxtail grew in lower areas.

Facilities:

The faulty water control structure was repaired in November. Concrete for the new pump station was poured, but the remainder of the station will be completed in 1989. The north dike is severely eroded with some areas barely 3 feet wide. It is scheduled for reconstruction if there is enough money after all other projects are done. At this time, funding is unlikely to stretch that far. The pump ditch needs dredging.

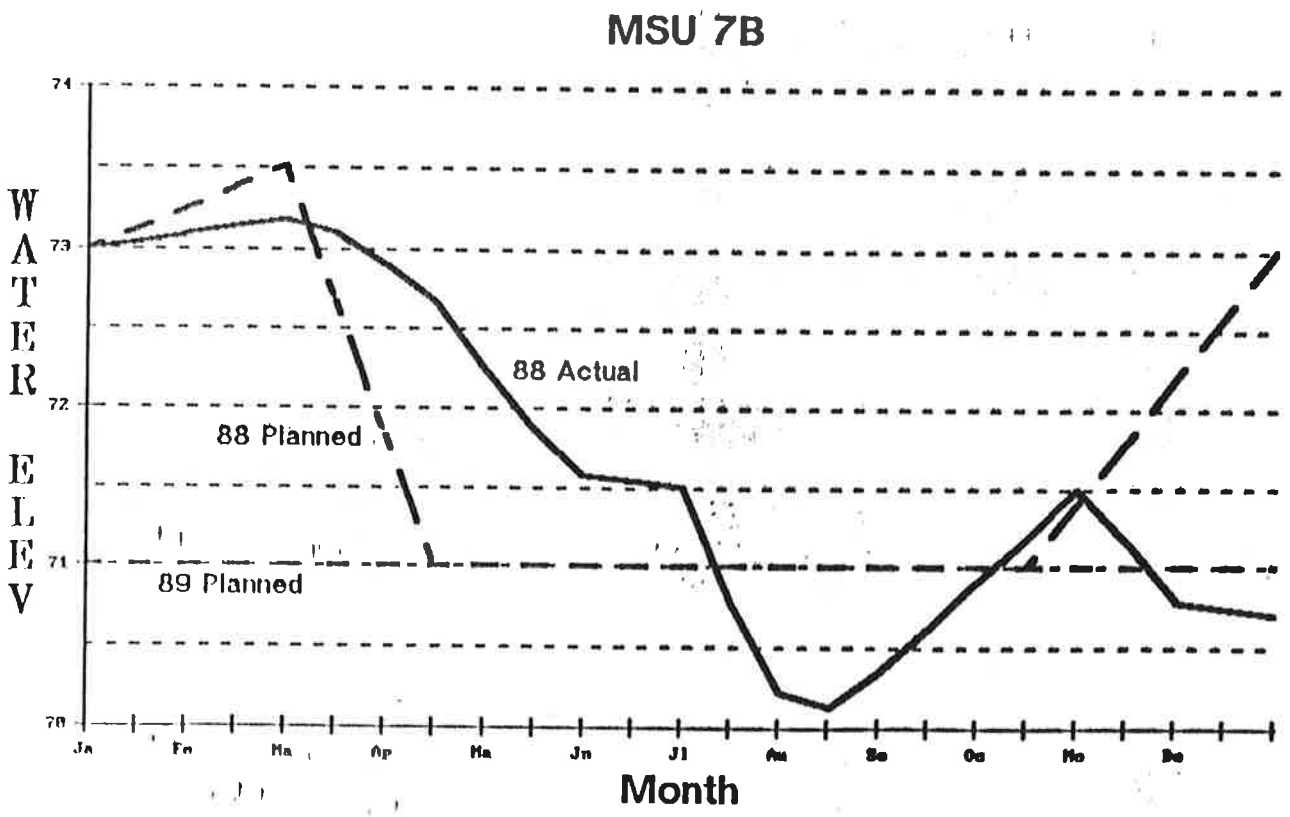
Costs:

The new pump station is covered under the Tank Ditch contract and will cost $ 42,500. Electricity for pumping cost $ 174.63.

B.2 Objectives of the 1989 Proposed Water Levels

Leave the unit dry in spring to facilitate pump station construction. Leave dry until a decision is made about dike construction funding.

1. Unit: MSU 7B
2. Acres 44
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure None
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Upland	35	40	15
Aquatic Smartweed/Cattail/Water	10	0	10
Smartweed/Millet	15	15	10
Bidens	30	35	25
Plowed	0	0	35
Cottonwood/Willow	10	10	5

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	10,000	15,000	3,000
Geese	15,000	30,000	5,000
GBH	500	500	250

9. Purple Loosestrife: A few scattered plants sprayed.

MSU 7B

A.2 Effects of Past Year's Water Levels

Levels:

This unit has no independent water control structure. All water level management is accomplished through 7A.

Results:

Low areas in the unit trapped enough water to produce several small stands of millet. Upland species dominated the rest of the unit and cottonwood is invading the north and west side. This area was plowed in early summer.

Facilities:

The north dike is severely eroded with some areas barely three feet wide. Dike construction is scheduled for 1989 under the Pool 7 Project.

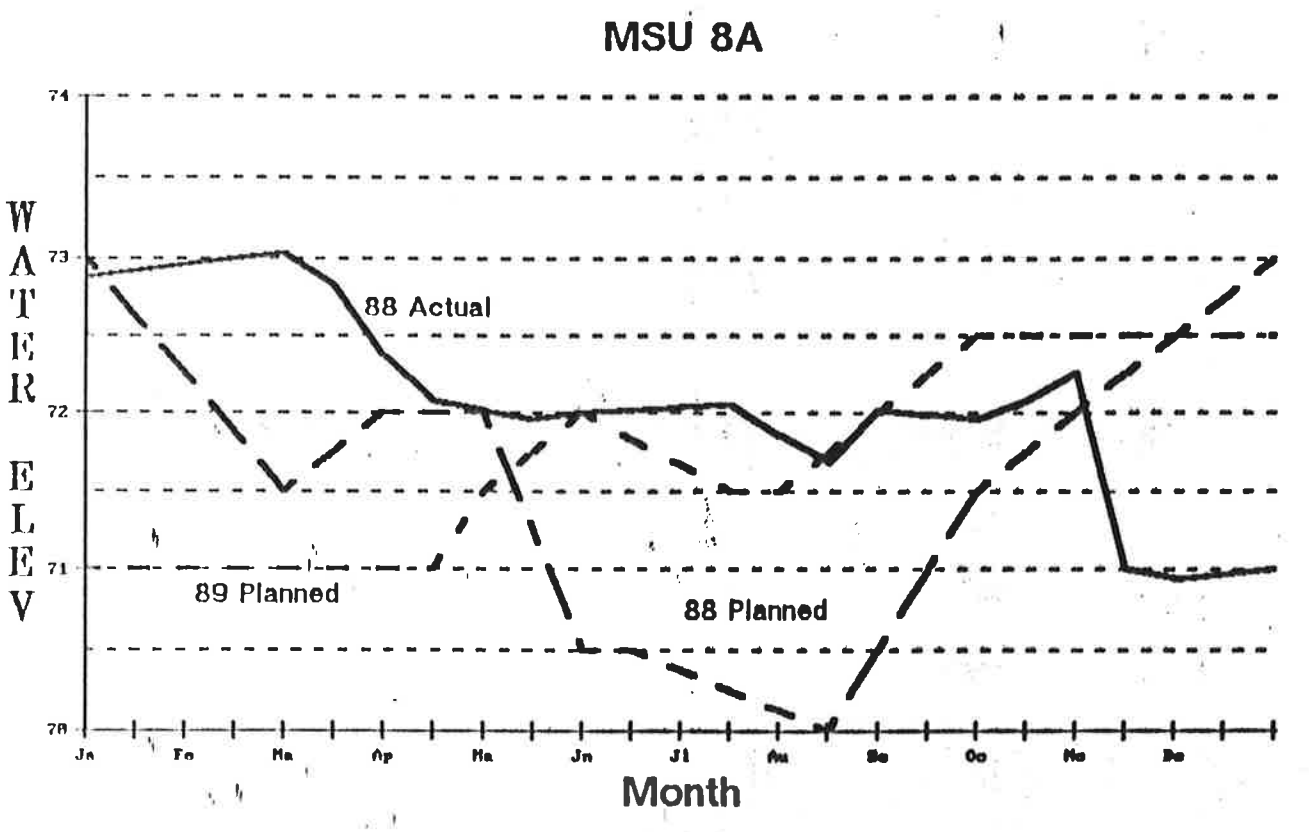
Costs:

None. The plowing was done by cooperative farmer in exchange for use of the field across the road.

B.2 Objectives of the 1989 Water Levels

Keep drawn down for the year to facilitate pump station construction and possible renovation of the north dike.

1. Unit MSU 8A
2. Acres 44
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Millet/Smartweed	40	11	20
Bidens	30	8	2
Open Water	2	(70)	50
Upland Sup./Velvet Leaf	10	11	25
Cottonwood/Willow	10	0	3

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	120,000	30,000	48,500
Geese	30,000	35,000	7,400
GBH	1,000	2,500	3,300

9. Purple Loosestrife: Area was surveyed, no plants noted.

MSU 8A

A.2 Effects of Past Year's Water Levels

Levels:

Water levels appear much higher than planned from May to November, but levels actually fluctuated within 6" of the general pool bottom. The ditch was not completely drained until construction required it in November. Leaving the water at general pool bottom level or slightly above keeps the ground moist and discourages velvet leaf and cockle bur from germinating.

Results:

Mixed results occurred with good stands of bidens and smartweeds mixed with even better stands of solid velvet leaf and cockle bur. Submerged aquatics developed on the east end. Excellent duck use in the summer when most marshes on and off the refuge were dry due to drought and drawdown.

Facilities:

Replacement of the farm pump started in November. The concrete walls were poured by the end of the year. The eroding west dike was shored up with muck from the canal and graded to provide better access for the contractors. The north and southwest dikes are straight up and down.

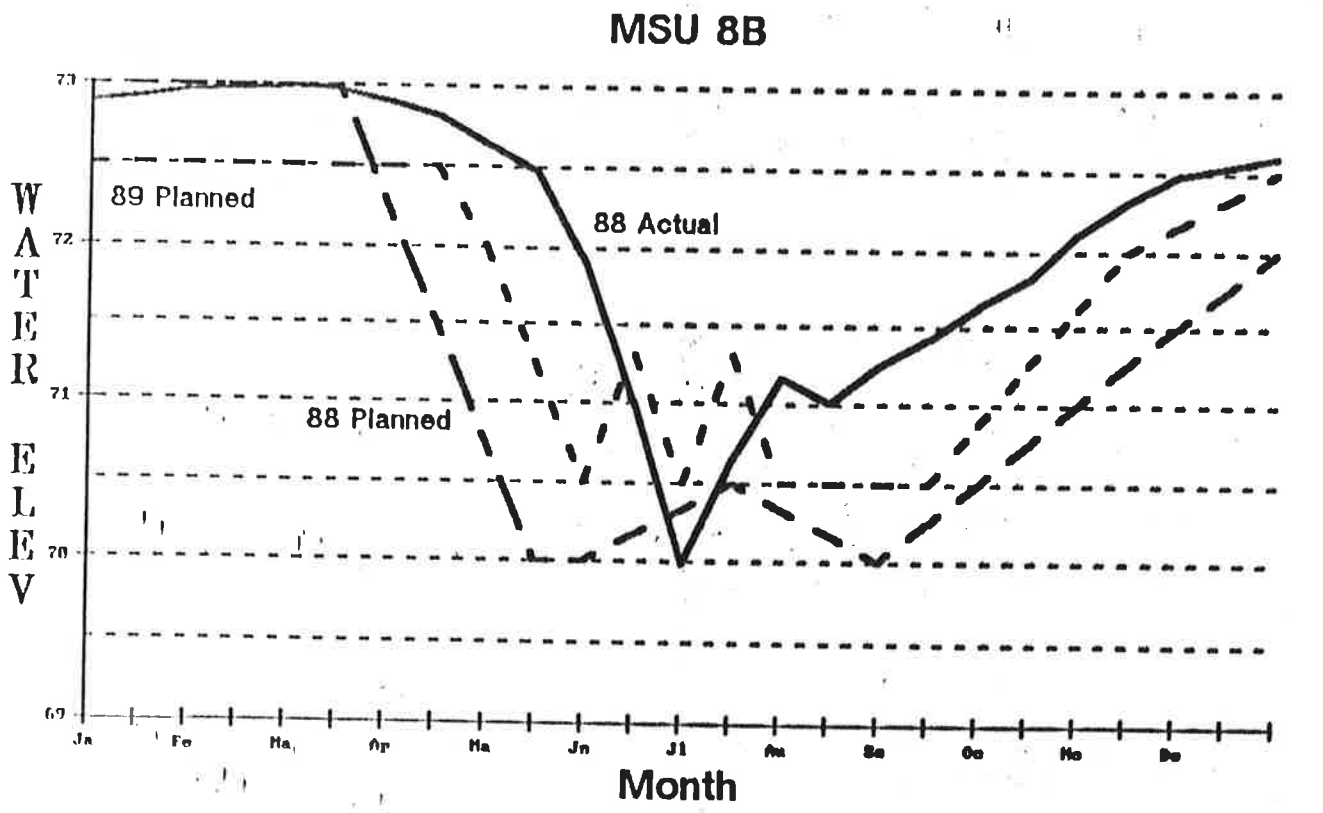
Costs:

Electricity to pump the unit down cost $126.10. The new pump station is expected to cost $ 42,500.

B.2 Objectives of the 1989 Proposed Water Levels

Maintain drawdown until the pump station is completed, then flood the area to wet soils, and allow to drain until germination is completed. Reflood in fall for migration.

1. Unit MSU 8B
2. Acres 85
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 571.5
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Millet (+ velvet leaf)	70	(33)	45
Bidens	15	55	30
Upland Species	10	6	10
Cocklebur	5	6	5
Water/Submerged Aquatics	____	____	10
_____	____	____	____

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	160,000	75,000	101,000
Geese	20,000	35,000	29,500
GBH	2,000	1,000	2,500

9. Purple Loosestrife: Several plants sprayed.

MSU 8B

A.2 Effects of Past Year's Water Levels

Levels:

Scheduled drawdown was delayed to provide more wetland habitat for the spring waterfowl migration. A new water level gauge installed in June read -.66 different than the old gauge. The difference in readings makes it appear that the levels dropped below the planned level. Contractors pumped into 8B to dewater Radar ditch in October, pushing levels higher than planned.

Results:

The late drawdown resulted in excellent millet and bidens response on the higher elevations and less velvet leaf and cockle bur. The unit was well used by waterfowl the entire year.

Facilities:

Minor erosion is a problem along the north dike. The unit should not be held as high as it was this fall or the north and west dikes will erode unnecessarily. The pump station is scheduled to be replaced in 1989.

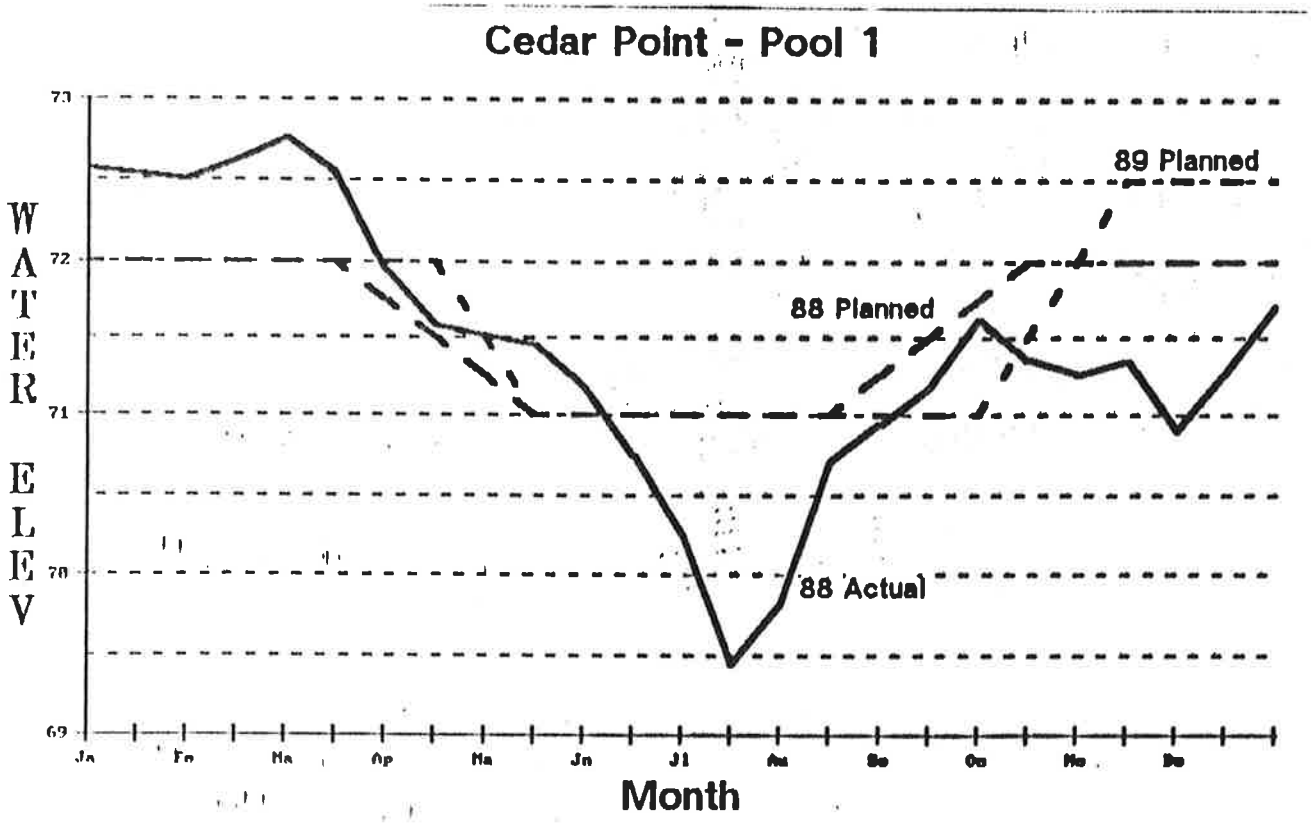
Cost:

Electricity to run the pump station cost $263.44. The dikes were mowed once. The new pump station was bid out at $ 42,500.

B.2 Objectives of the 1989 Proposed Water Levels

Drawdown slowly from April to May to encourage moist soil plants. Add several inches twice during the summer to wet the soil and drown undesirable species. Reflood in fall for waterfowl migration.

1. Unit Cedar Point - Pool 1
2. Acres 1,460
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	50	45	3
Water Lily	20	10	2
Cattail	10	20	20
Burreed/Bulrush	5	5	10
Other	5	10	10
Smartweed/Millets/Nutsedge			55

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	600,000	560,000	693,000
Geese	100,000	110,000	53,000
GBH	15,000	16,000	40,600

9. Purple Loosestrife: Infestation increasing throughout pool due to drawdown and drought. Spraying done from ATV and truck sprayer.

Cedar Point - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water level gauge was installed in May. Levels were estimated before by measuring the difference between the water and the top of the water control structure culvert. The pool was essentially drained by early summer and expected to retain some water in low areas. These areas evaporated by late June and could not be refilled because of low lake levels. The low lake levels predominated throughout the fall keeping the pool levels lower than planned. Water would have been retained at a higher fall level if sticks had not jammed the structure open. The dilapidated trash guards were replaced after a foot of water was lost.

Results:

Areas that were open water last year developed dense stands of Walter's millet, smartweeds and nutsedge. Loosestrife did not germinate and spread as feared because of competition with 6' smartweed. The area was too dry to encourage emergent vegetation as originally hoped, but the vegetation in the bays should keep wind and wave action to a minimum and improve water quality in the upcoming years.

Facilities:

Past high water levels have caused erosion along the north, southwest and south dikes. The drainage canal between the Pheasant Farm and Pool 1 is severely eroded and scheduled for renovation in early 1989. A majority of the road system needs grading and gravel. The dike that borders the fishing barrow pit is becoming dangerously narrow in two spots. The water control structure between Pools 1 and 2 has no board walk and is very unsafe to operate. All interior canals are completely silted in and need dredging. At this time, they are a hazard to anyone attempting to cross the 4' deep muck. Dikes were mowed and roads graded once.

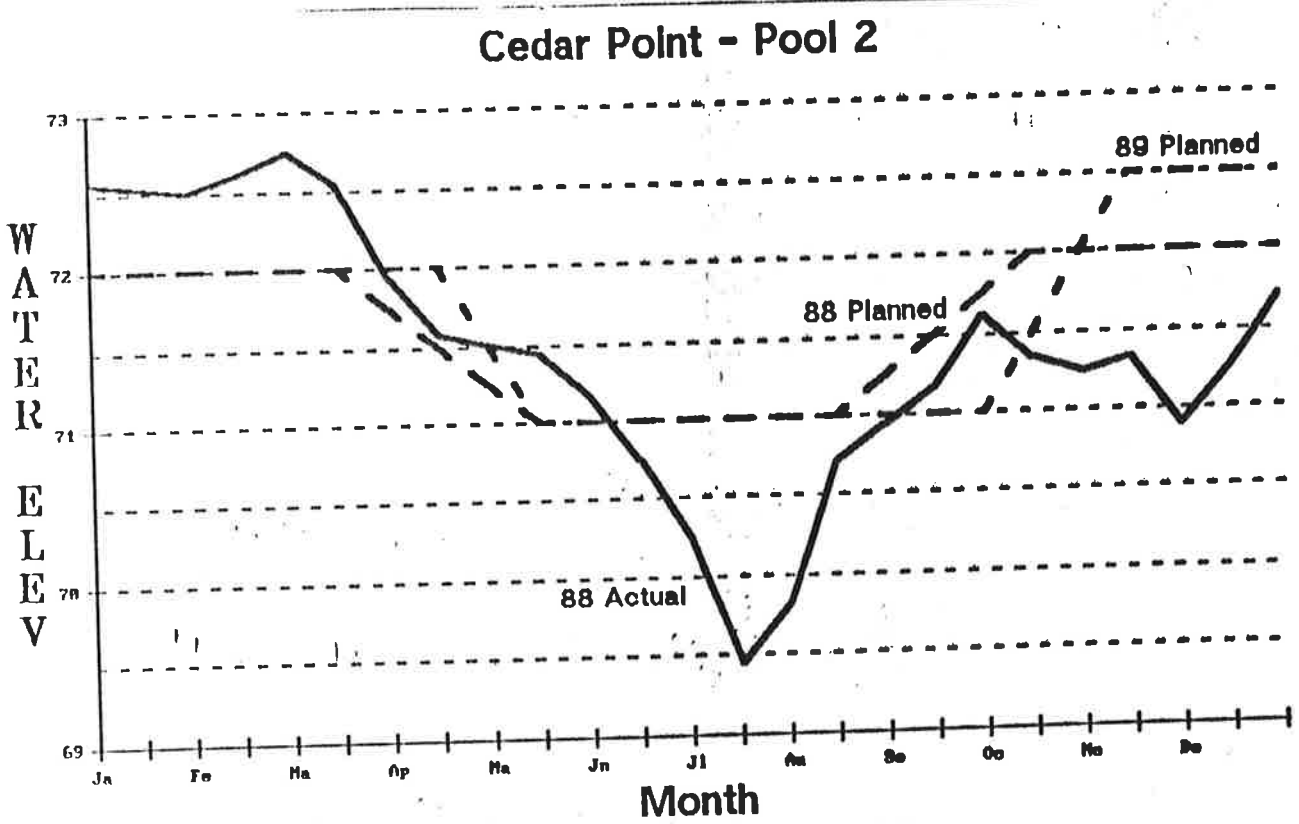
Costs:

All dikes were mowed once.

B.2 Objectives of 1989 Proposed Water Levels

Drawdown to facilitate construction and encourage emergent vegetation. If construction schedules allow, reflood in fall for waterfowl migration. The drawdown may encourage purple loosestrife germination.

1. Unit Cedar Point - Pool 2
2. Acres 135
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	65	65	5
Cattail	20	20	20
Bullrush	5	5	5
Burreed	5	5	3
Phragmites/Willow	5	5	7
Smartweed/Millet/Nutsedge	____	____	60

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	55,000	78,000	308,300
Geese	20,000	10,000	14,100
GBH	5,000	4,100	18,800

9. Purple Loosestrife: Heavy to moderate infestation sprayed with truck and backpack sprayers.

Cedar Point - Pool 2

A.2 Effects of Past Year's Water Levels

Levels:

Pool 2 water levels are directly connected with Pool 1 through the interconnecting water control structure. That structure was opened last March, allowing Pool 2 to drain with Pool 1. The drought completely dried the pool. Fall rains added several inches to the water level, but there is no direct way to add water.

Results:

Excellent stands of smartweeds, millet and nutsedge developed in open areas. The centers of the bays grew only sparse clumps of nutsedge. Cottonwood seedlings germinated in the east end. The Phragmites stand continues to spread farther into the pool. Area should be burned next year.

Facilities:

The main water control structure has been silted in for years and the secondary structure connected to Pool 1 is unsafe. The elevation difference between Pool 1 & 2 make it difficult to add water to Pool 2 from that direction. The north and east dikes are in good condition. The south dike has little slope left and the east dike is breached.

Costs:

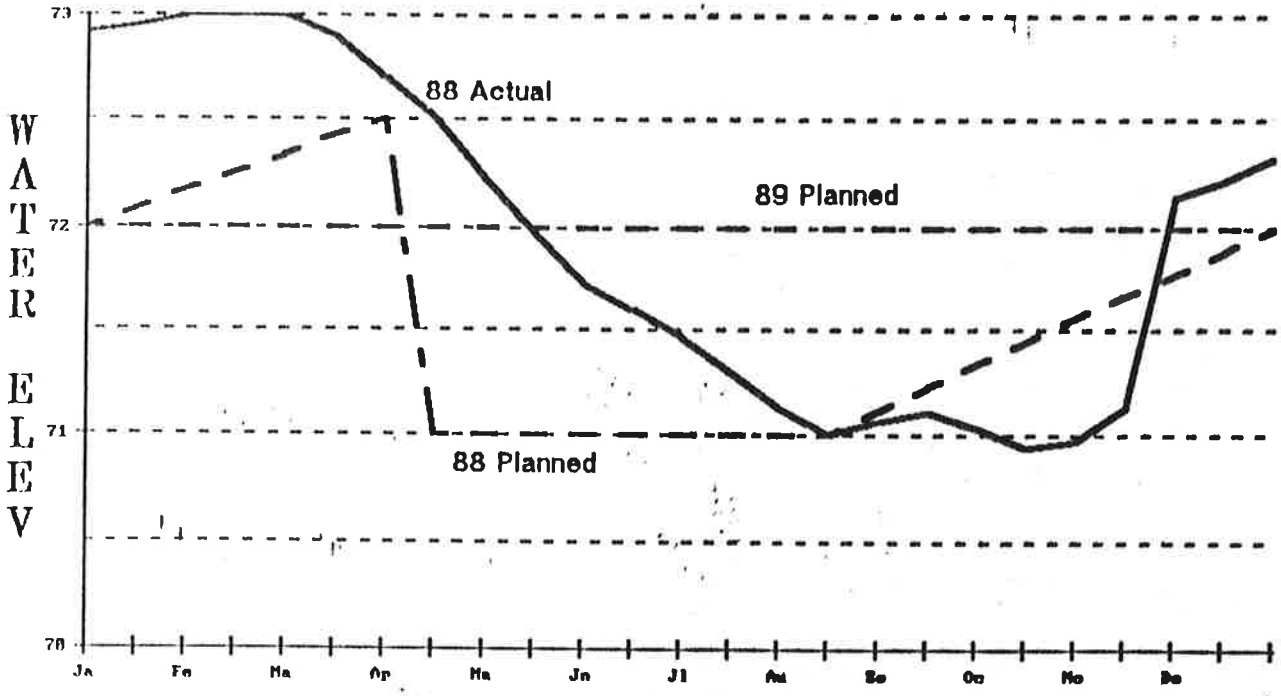
Dikes were mowed and roads graded once.

B.2 Objectives of 1989 Proposed Water Levels

Close the Pool 1/2 water control structure after Pool 1 levels have dropped. Precipitation may partially fill the pool and encourage emergents.

1. Unit Cedar Point Pheasant Farm
2. Acres 155
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 571
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed - _____

Cedar Point - Pheasant Farm



7. Vegetation:

Species	%1986	%1987	%1988
Cattail	20	60	45
Open Water (submerg.aquatics)	70(35)	25	20
Burreed/Arrowhead	10	10	5
Smartweed/Millet	0	5	20
Other (Purple Loosestrife)			10

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	90,000	40,000	175,500
Geese	20,000	4,000	33,000
GBH	15,000	2,000	8,500

9. Purple Loosestrife: Heavy infestation throughout the unit. Unable to hold water high to discourage germination because of leaking dikes.

Cedar Point - Pheasant Farm

A.2 Effects of Past Year's Water Levels

Levels:

Water levels dropped slowly from March to August. After the first 6" of water drained, the rest leaked through the dikes or evaporated. The unit remained low until precipitation and rising lake levels flooded it again.

Results:

Last year's objective of keeping water off the face of eroding dikes was accomplished. Vegetative response to the low water levels include good stands of smartweeds and bulrush and also purple loosestrife.

Facilities:

The dikes of this unit are in poor condition. Banks of the west and east dikes severely eroded. The south and north dikes are eroded on the interior side only.

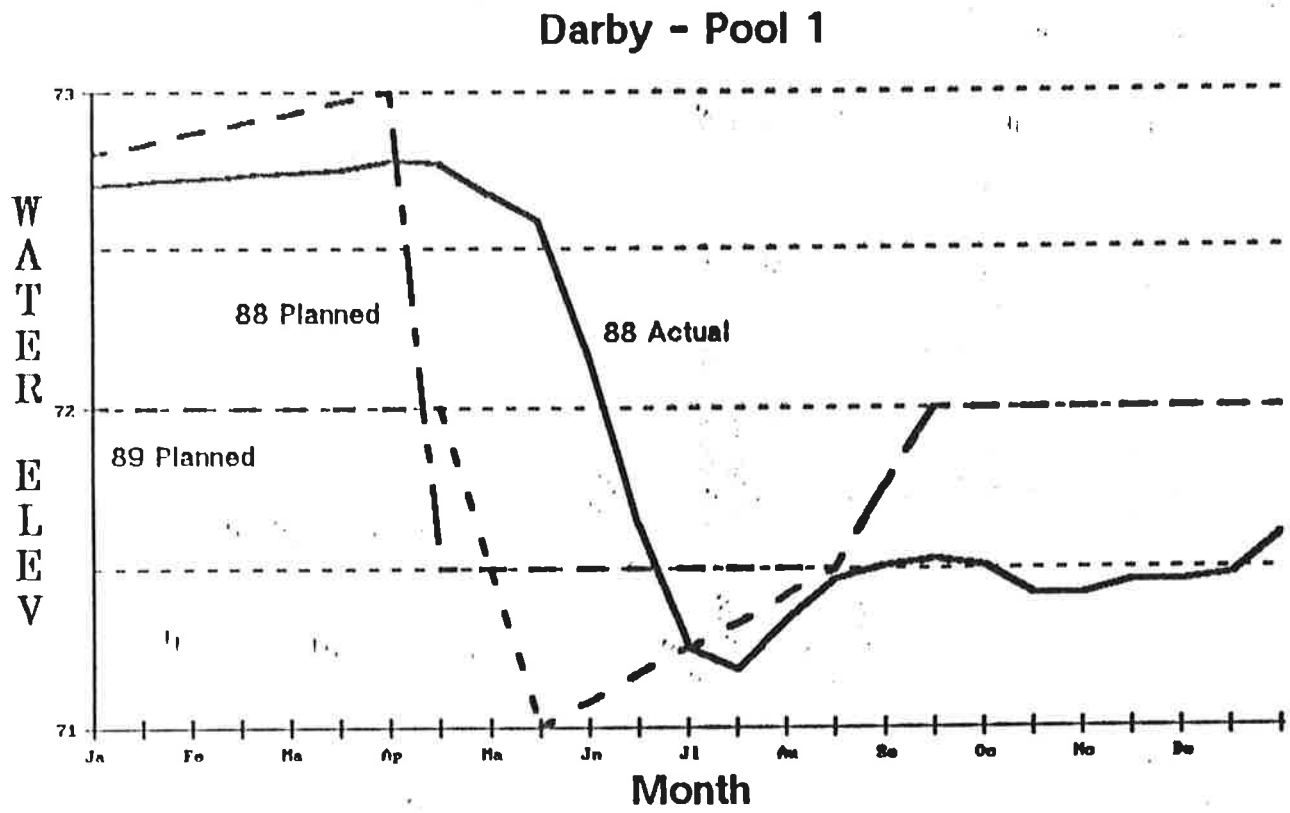
Costs:

The road on the north dike was graded once. New water level gauge was installed in June.

B.2 Objectives of 1989 Proposed Water Levels

Try to hold water levels stable at 6" above the general pool bottom to reduce purple loosestrife germination, open up cattails, and provide brood habitat.

1. Unit Darby - Pool 1
2. Acres 200
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 566
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	50	20	30
Bulrush/Burreed	15	10	5
Cattail, Bluejoint, Other	10	20	20
Floating Emergents	25	50	25
Smartweed/Millet/Nutsedge			25

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	90,000	94,000	157,500
Geese	70,000	30,000	24,000
GBH	8,000	5,000	9,300

9. Purple Loosestrife: Moderate infestation with scattered individuals throughout unit, one area of heavy infestation in the center of unit. Accessible areas sprayed with truck and backpack sprayers.

Darby - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

The scheduled partial drawdown was delayed to provide resting/feeding habitat for spring migrants. Levels dropped lower than expected in summer due to the drought. Slightly higher lake levels did not bring pool levels up to plan.

Results:

Water not choked with spadderdock, pickerel weed or lotus was full of submerged aquatics (canals and east end). Exposed edges had good stands of smartweeds and millets. Rose mallow and purple loosestrife continue to be a problem in the unit. Waterfowl use was steady throughout the year.

Facilities:

All but the east dike have slight to moderate erosion. The board supporting the water level gauge needs replacing.

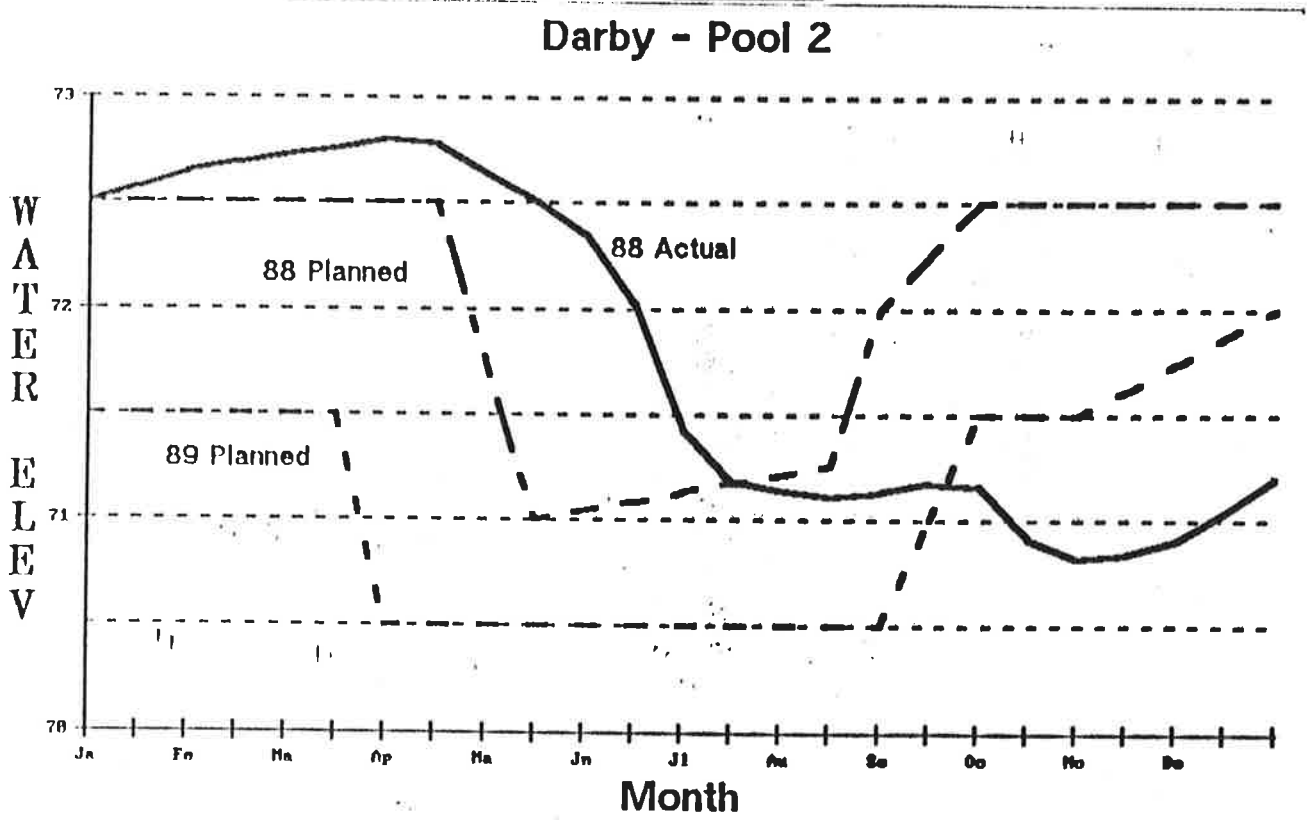
Costs:

All dikes were mowed and roads graded once in 1988. No pumping costs were incurred.

B.2 Objectives of 1989 Proposed Water Levels

Partial drawdown to encourage germination of emergents yet still provide some brood habitat.

1. Unit Darby - Pool 2
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water/Submergents	40	25	15
Dead Cattail/Duckweed	55	0	0
Cattail	5	10	5
Pickerel Weed	0	55	5
Other (Inc. Purple Loosestrife)		10	10
Smartweed/Millet/Nutsedge			65

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	7,500	5,500	6,000
Geese	1,000	100	1,000
GBH	2,000	850	2,000

9. Purple Loosestrife: Heavy infestation in center of unit and along south dike. Edges sprayed with the truck sprayer, center patch sprayed once with backpack sprayer.

Darby - Pool 2

A.2 Effects of Past Year's Levels

Levels:

Drawdown delayed to provide spring migration habitat. Low lake levels prevented reflooding in the fall.

Results:

Excellent mixture of Walter's millet and smartweed throughout the pool. Purple loosestrife infestation remaining stable despite efforts to control it.

Facilities:

Dikes along the west and south sides are in good shape. The banks of the north and east dikes are eroded and without rip-rap protection. The culvert of the water control structure is rusted through and will be replaced in 1989. The pool cannot hold water and will fluctuate with the canal until then.

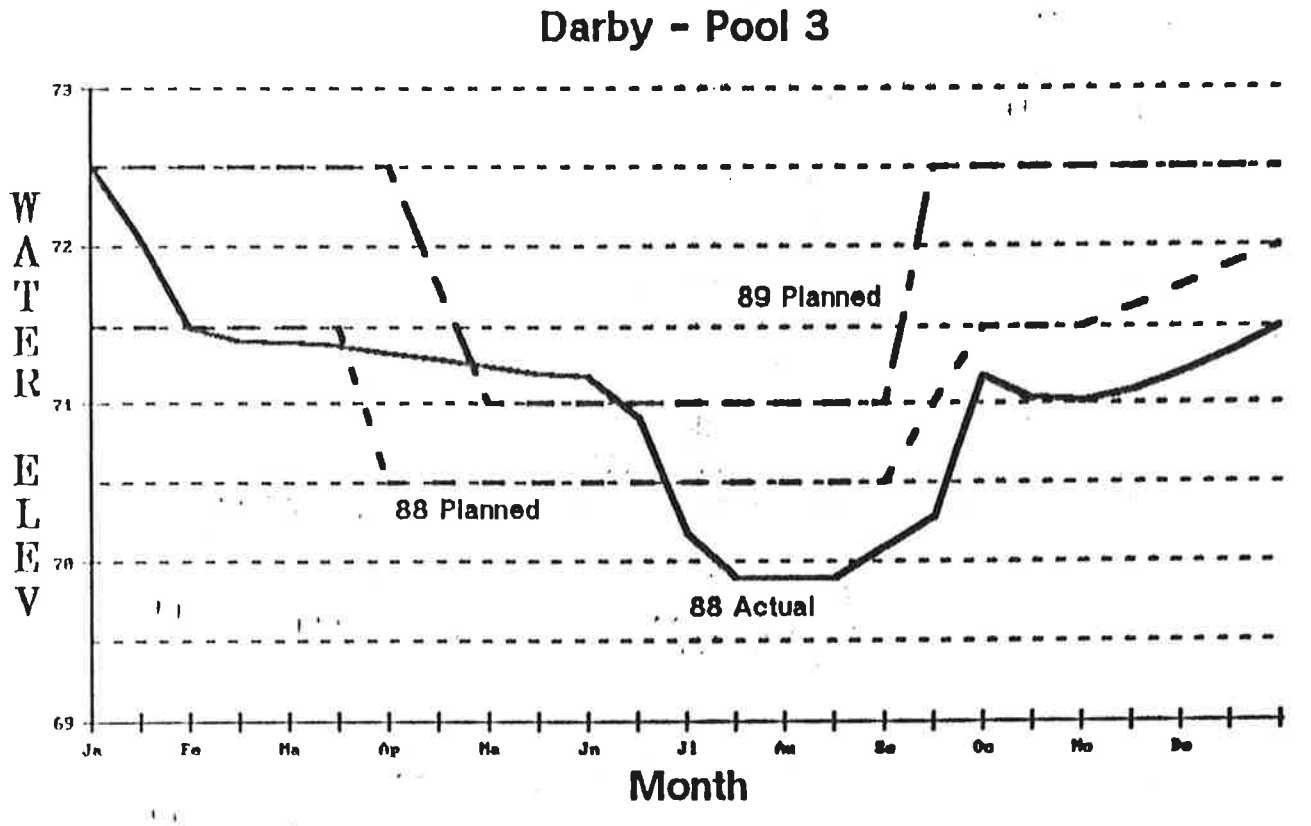
Costs:

Dikes were mowed once. There were minor pumping costs when the unit was dewatered to inspect the water control structure. The 3" diaphragm pump was used.

B.2 Objectives of 1989 Proposed Water Levels

Drawdown the pool with the canal to facilitate construction and allow installment of the new water control structure. Try to reflood in fall if lake levels cooperate or pump station is completed.

1. Unit Darby - Pool 3
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	97	98	30
Aquatic Smartweed	1	0	0
Smartweed/Millet/Nutsedge			65
Other	2	2	15

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	1,000	1,050	35,600
Geese	1,500	100	5,500
GBH	500	450	1,300

9. Purple Loosestrife: Several individual plants on west end of borrow area sprayed.

Darby - Pool 3

A.2 Effects of Past Year's Levels

Levels:

A faulty water control structure made levels impossible to manage. Water levels rose and fell with level of the canal.

Results:

Nutsedge, smartweeds and millets covered the entire unit.

Facilities:

The north, east and west dikes are eroded on both sides and need resloping and rip rap protection. The south dike is in good condition. The water control structure culvert is rusted all the way through and efforts to patch it with steel and tar were unsuccessful. It will be replaced in 1989.

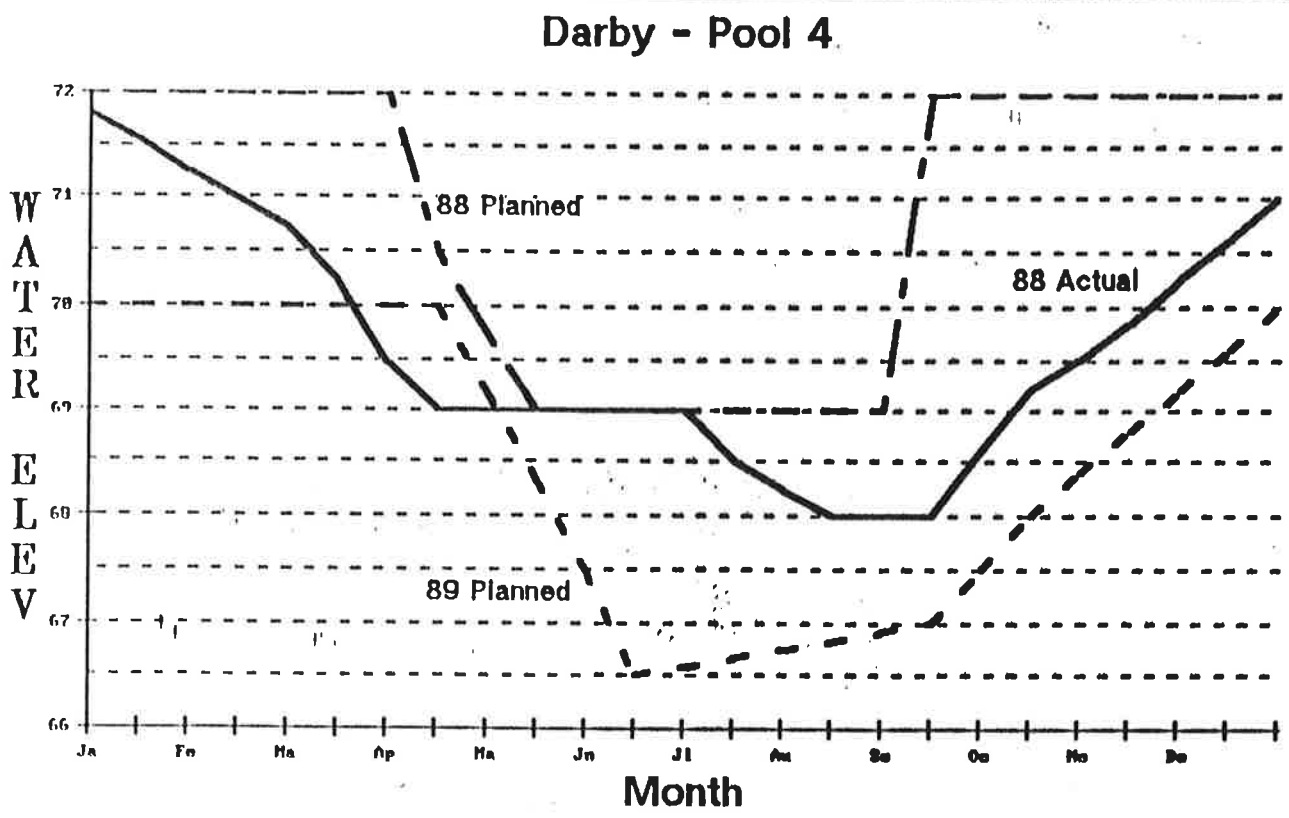
Costs:

Minor costs were incurred when the unit was dewatered to fix the structure. The attempt to fix the structure cost approximately $100.

B.2 Objectives of 1989 Proposed Water Levels

Renovation of the water control structure and connecting canal requires drawing the unit down (WCS will not hold water). The new water control structure and pumping station will allow for more precise management of this pool.

1. Unit Darby - Pool 4
2. Acres 170
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 566.6
5. Water Elev. with 50% bottom exposed - 567.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1986	%1987	%1988
Open Water	90	91	61
Floating emergents	2	<1	<1
Cattail	1	1	1
Cottonwood/Willow	5	5	7
Other	2	2	6
Smartweed/Millet/Nutsedge			25

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	1,500	25,000	136,000
Geese	500	1,200	23,000
GBH	500	500	5,200

9. Purple Loosestrife: Moderate to heavy infestion on southern end, scattered individual plants along dikes - sprayed with backpack and truck sprayers.

Darby - Pool 4

A.2 Effects of Past Year's Water Levels

Levels:

The spring drawdown by gravity drainage still left 70% of the unit covered with water. The drought dropped the water level another foot by August, exposing another 20%. The area was reflooded in the fall to allow neighboring farmers to get water to their crops.

Results:

The pool edges developed excellent stands of nutsedge, millets and smartweeds. Water quality should improve next year with reduction in wind and wave action and in the number of carp. The area was used by a variety of diving and dabbling ducks in the fall and winter.

Facilities:

The west and south dikes are slightly eroded but still in fair condition. The water control structure on the south side needs a new boardwalk.

Costs:

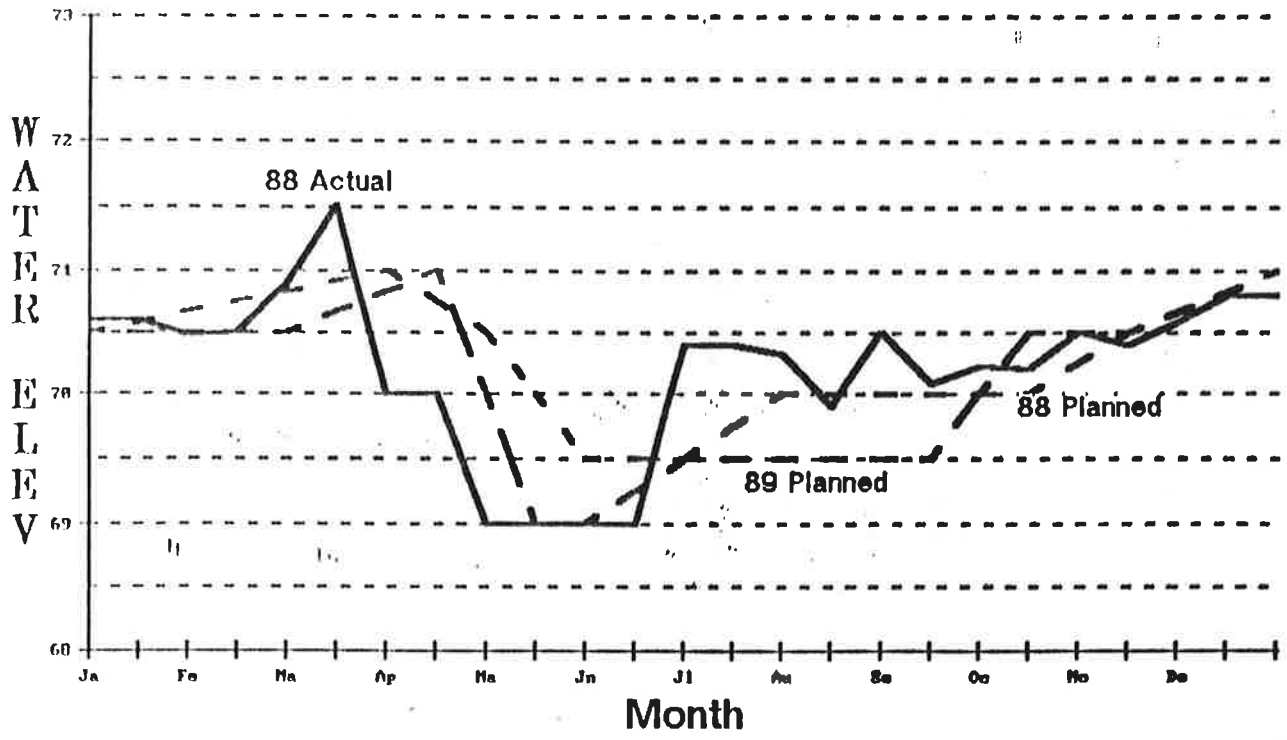
All dikes were mowed once - no pumping costs incurred.

B.2 Objectives of 1989 Proposed Water Levels

Gravity drain to facilitate construction in the canal and replacement of the main water control structure. The drawdown will allow the bay area to vegetate, reducing wind and wave action in the fall and improving water quality for submerged aquatics.

1. Unit Navarre - Pool 1
2. Acres 130
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569.5
5. Water Elev. with 50% bottom exposed - 568.5
   90% bottom exposed - _____

Navarre - Pool 1



7. Vegetation:

Species	%1986	%1987	%1988
Open Water/Water Lily	60	45	40
Cattail	20	30	20
Bulrush/Burreed	5	10	5
Cottonwood/Willow	10	10	10
Other	5	5	5
Smartweed/Millet	____	____	20

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	50,000	47,000	131,000
Geese	100,000	38,000	107,000
GBH	10,000	6,000	5,600

9. Purple Loosestrife: Several individual plants located and sprayed by Davis Besse personnel.

Navarre - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels generally followed the water management plan for the year. There is still some problem in getting the union at Davis Besse to follow the plan closely.

Results:

Vegetation response was excellent as millets and smartweeds pioneered all available areas.

Facilities:

Only the boundary signs are maintained by the refuge. The signs should be checked in 1989.

Costs:

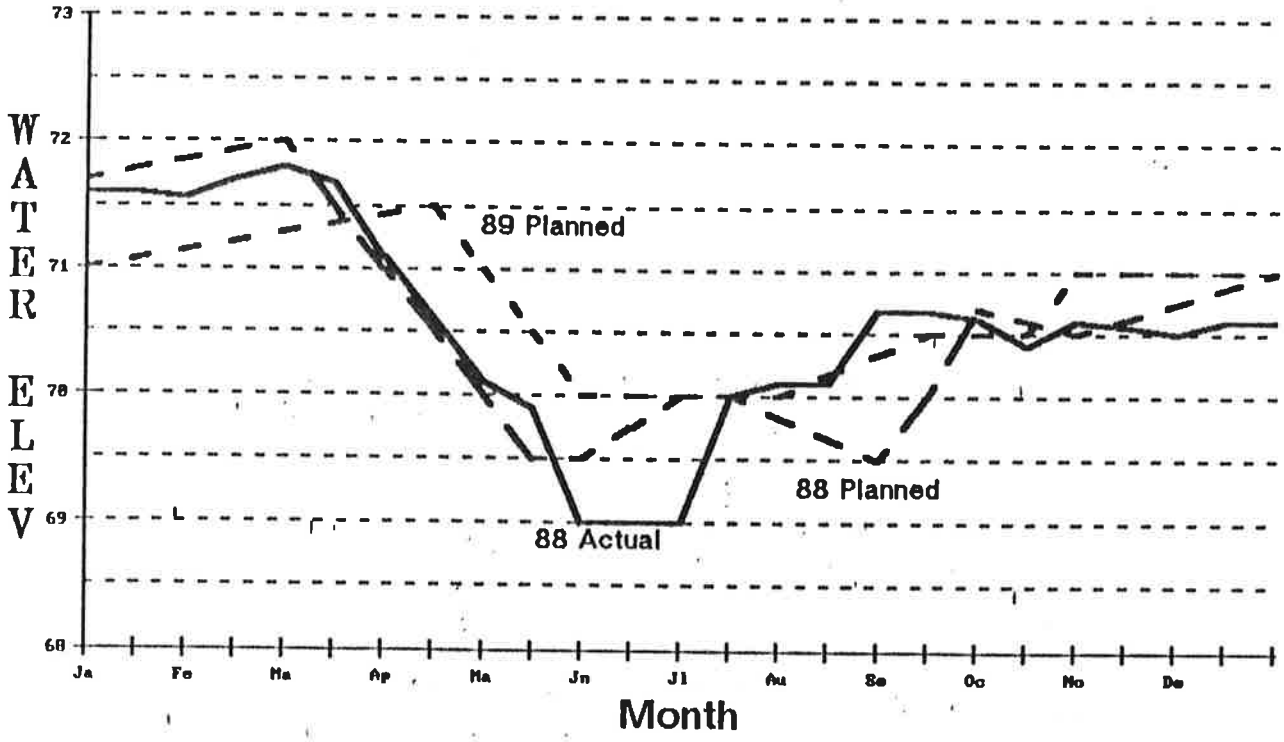
All pumping costs were paid be Toledo Edison.

B.2 Objectives of 1989 Proposed Water Levels

Partial drawdown of the area to encourage emergent vegetation, yet still provide spring migration and brood habitat.

1. Unit Navarre - Pool 2
2. Acres 340
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569.5
5. Water Elev. with 50% bottom exposed - 569.5
   90% bottom exposed - _____

Navarre - Pool 2



7. Vegetation:

Species	%1986	%1987	%1988
Cattail	40	40	25
Bulrush	10	10	10
Burreed	5	5	5
Water Lily/Lotus/Submerged	35	30	30
Other (Bluejoint,mallow, etc.)	20	15	15
Smartweed/Millet	____	____	15

8. Wildlife Use:

	Use Days 1986	1987	1988
Ducks	140,000	120,000	240,000
Geese	260,000	121,000	135,500
GBH	30,000	12,000	9,000

9. Purple Loosestrife: Few individual plants pulled or sprayed.

Navarre - Pool 2

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were as planned with a slight deviation in the summer. The level was drawn down 6" too much and the unit filled too soon.

Results:

Objective of encouraging annuals was accomplished. Smartweeds, millets and rushes grew in all available space.

Facilities:

Only boundary signs are maintained by the refuge.

Costs:

All pumping costs were covered by Toledo Edison.

B.2 Objectives of 1989 Proposed Water Levels

Partial drawdown to encourage emergent vegetation while still providing brood habitat.

1. Unit Navarre - Pool 3
2. Acres 188
3. Maximum elevation permissible unknown
4. Flowline elevation of lowest structure unknown
5. Water Elev. with 50% bottom exposed - " "
   90% bottom exposed - _____

7. Vegetation:

Species	%1986	%1987	%1988
Open Water	97	97	0
Smartweed			98
Willow/Cottonwood/Sumac	3	3	3

8. Wildlife Use:

	Use Days		
	1986	1987	1988
Ducks	unknown	unknown	19,200
Geese			4,000
GBH			1,200

9. Purple Loosestrife: Area surveyed with negative results.

Navarre - Pool 3

A.2 Effects of Past Year's Water Levels

Levels:

No graph is available for this pool. The lease agreement was finalized May 1988 and the information has not been entered into the computer system yet. The pool was drawn down in the spring. The summer drought conditions dried the soil enough to create large cracks on the pool floor. Water was added in November, when the gates to the Toussaint River were opened. When the gates were closed, pool levels had risen to the bottom of the culvert pipes.

Results:

A monoculture of 6-7' smartweed developed with cottonwood stems interspersed. The smartweed stems were not as dense as normal because of the lack of rain, but once their roots reached subsurface water, they grew quickly.

Facilities:

Only boundary signs are maintained by the refuge. The environmental section of Davis Besse has ordered flap gates for the interior side of the structure so prevent water from flowing out when the lake is low.

Costs:

All pumping costs and the flap gate costs were covered by Toledo Edison.

B.2 Objectives of 1989 Proposed Water Levels

Keep the water level even with the bottom of the culverts to encourage emergent vegetation on the higher elevations and submerged aquatics in the center of the pool.